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ABSTRACT

Assessment is more than simply ascribing an 'A' or a 'B' to a particular student achievement. In an era of state-mandated proficiencies and alternative assessment strategies, educators need practical ideas they can use to meaningfully assess their students' learning and their own practice. This issue of "ENC Focus" centers on the topic of inquiry and problem solving. Featured articles include: (1) "Facing--and Embracing--the Assessment Challenge" (Carol Damian); (2) "Standardized Test Scores and Alternative Assessments: Different Pieces of the Same Puzzle" (William E. Loadman and Anne Marie Thomas); (3) "Implementing Portfolios and Student-Led Conferences" (Jennifer Williams); (4) "Assessing Student Understanding with Interactive-Collaborative-Electronic Learning Logs" (Paul Hickman); (5) "Using Self Evaluation with Fourth Graders" (Leah Poynter); (6) "Assessing Student Learning--and My Teaching--Through Student Journals" (Bill Heinmiller); (7) "Determining What Is To Be Taught: The Role of Assessment" (Nancy S. Cole); (8) "Statewide Portfolio Assessment in Mathematics: A Teacher's Perspective" (S. Leigh Nataro); (9) "Why You Should Care about TIMSS" (Tracy Crow); (10) "Students Will Rise to the Challenge" (Eugene Watts); (11) "Author Takes on High-Stakes Tests" (Julia Harris); (12) "State Achievement Tests Can Be a Positive Force in Your Classroom" (Mary Ann Stine); (13) "Aligning Assessment with Learning Goals" (Natalie Nielsen); and (14) "Finding Materials to Meaningfully Assess Students" (Terese Herrera and Carol Damian). Educational news, editorials, essays, classroom stories, columns on topics of interest to classroom innovators, and an extensive annotated list of assessment resources are also included. (ASK)

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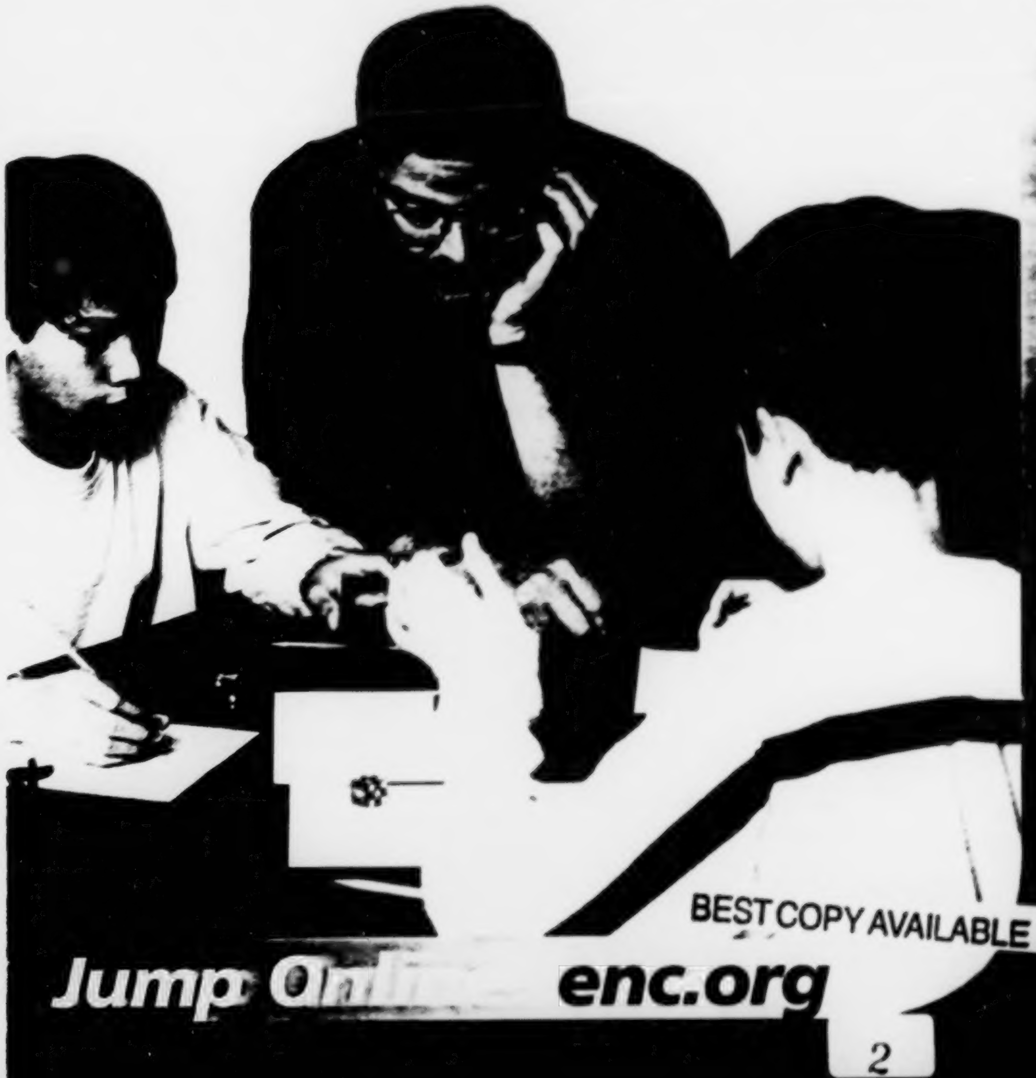

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contents

ENC Focus: A Magazine for Classroom Innovators, Volume 7, Number 2

Theme for this Issue: Assessment That Informs Practice

This icon invites you to visit the Internet for more information, more resources, more ideas for your own classroom innovations. The online version of this publication will help you get started. Visit enc.org/focus/assessment

Update: Around the Clearinghouse and the Nation

This section features educational news, editorials, essays, classroom stories, and columns on topics of interest to classroom innovators.

4 ***Editorial:***
"…Where…All the Children Are Above Average"
by Annette Thorson

6 ***ENC's Partners:***
NCTM's Principles and Standards for School Mathematics
by Leah Poynter
This regular column features organizations that collaborate with ENC.

7 ***Innovators' Forum Online***
Participate in ENC's discussion for all those interested in educational improvement.

8 ***ENC's Partners:***
Eisenhower Regional Consortia and ENC Demonstration Sites
Check here for complete contact information for ENC's primary partners.

10 ***ENC in Action***
Tools for Enhancing Professional Development
by Nancy Grimes
This professional development facilitator in Iowa relies on ENC's electronic and print resources.

11 ***Using the Internet***
School and Home Connect Through the World Wide Web
by Kimberly S. Roempler
ENC's Associate Director of Instructional Resources writes about her experiences using the Internet in her work as an educator.

13 ***Going for Grants***
The Grantwriter's Bookshelf
by Tracy Crow
Check this regular column for information about finding and applying for money to support innovative projects in mathematics and science education.

15 ***Writers' Guidelines for ENC Focus***
Turn here for information on future topics and on how teachers and students can contribute to this publication.

Cover photo by Zaki Tahir ©Eisenhower National Clearinghouse.

ASSESSMENT THAT INFORMS PRACTICE

Focus on Assessment That Informs Practice

This section presents articles on the theme of this issue.

16 Facing—and Embracing—the Assessment Challenge
by Carol Damian
ENC's new science education specialist bases her remarks about educational assessment on more than 20 years' experience as a high school teacher.

18 Standardized Test Scores and Alternative Assessments: Different Pieces of the Same Puzzle
by William E. Loadman and Anne Marie Thomas
Despite the ongoing debate, these two types of assessment do not need to be mutually exclusive; both can provide important information to teachers.

21 Implementing Portfolios and Student-Led Conferences
by Jennifer Williams
This middle school teacher in Minnesota devised an assessment strategy that caught on with teachers of all subject areas.

24 Assessing Student Understanding with Interactive-Collaborative-Electronic Learning Logs
by Paul Hickman
A Massachusetts science teacher describes how technology enhances communication between student research groups and their teacher.

28 Using Self Evaluation with Fourth Graders
by Leah Poynter
Elementary school is not too early to help students learn to assess their own achievement. A veteran teacher tells how.

31 Assessing Student Learning—and My Teaching—Through Student Journals
by Bill Heinmiller
This physics teacher finds the challenges of using student journals as an embedded assessment strategy are amply repaid by the benefits.

34 Determining What Is to Be Taught: The Role of Assessment
by Nancy S. Cole
The president of the Educational Testing Service discusses the relationship between curriculum and standardized testing.

35 Statewide Portfolio Assessment in Mathematics:
A Teacher's Perspective
by S. Leigh Nataro
A teacher who helped implement Vermont's statewide portfolio assessment system tells how and why it works.

41 Why You Should Care About TIMSS
by Tracy Crow
Here are a few simple ideas on how results of the Third International Mathematics and Science Study (TIMSS) can be used as a starting point for discussion of classroom assessment and practice.

42 Students Will Rise to the Challenge
by Eugene Watts
This state senator, who enacted his state's proficiency test legislation, has faith in the system—and students.

43 Author Takes on High-Stakes Tests
by Julia Harris
Alfie Kohn, an opponent of high-stakes proficiency tests, offers his reasoning.

44 Crunch Time
A news item from *The New York Times* on the web reveals that some states are backpedaling on their assessment mandates.

45 State Achievement Tests Can Be a Positive Force in Your Classroom
by Mary Ann Stine
This middle school teacher in the state of Washington used mandated testing as a springboard to excellence and student involvement.

47 Aligning Assessment with Learning Goals
by Natalie Nielsen
Educators concerned about aligning assessment with national and state standards will soon have support from Project 2061 of the American Association for the Advancement of Science.

THE ENC COLLECTION

Focus on the Collection

This section presents abstracts of materials from the ENC Collection chosen to illustrate this issue's theme, Assessment That Informs Practice.

49 Finding Materials to Meaningfully Assess Students
by Terese Herrera and Carol Damian

50 Featured Resources

82 For Further Reading

JUMP ONLINE!

All the articles and resources in this magazine are also available in the online version. Visit: enc.org/focus/assessment

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ENC welcomes readers' comments and questions. Please address them to:

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update:

around the Clearinghouse and the Nation

"...WHERE... ALL THE CHILDREN ARE ABOVE AVERAGE."

by Annette Thorson, ENC Publishing

> *"Welcome to Lake Wobegon, where the women are strong, the men are good looking, and all the children are above average."*
> —*Garrison Keillor*

> *"Not everything that counts can be counted, and not everything that can be counted counts."*
> —*Albert Einstein**

Most of the time, I am glad that the quirky happenings in Keillor's imaginary Minnesota town are, well, imaginary. But as a teacher and parent, I sometimes have wished I really could live in a place where all the children could be described so lovingly as "above average." Even with the current emphasis on criterion-referenced assessment, in which, theoretically, everyone can succeed, we know there are times when the bell-shaped curve looms large, when there must be winners and losers, when people forget that "not everything that counts can be counted."

When the *ENC Focus* staff got together to plan this issue on assessment, we were struck by the scope of the topic and the intensity of the debate surrounding it. We knew we could not ignore the controversies associated with high-stakes, state-mandated tests, but we also knew our readers count on ENC to bring them practical ideas to use with their students.

**Quoted by Linda Mabry in her book,* Portfolio Plus: A Critical Guide to Alternative Assessment, *p. 5 (Corwin Press, 1999).*

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We decided it is important to clarify the connection between standardized testing and daily classroom assessment, so we begin the theme article section with an essay by veteran classroom teacher, Carol Damian, who recently joined ENC's staff as Science Content Specialist (page 16). Her views are confirmed in the second article, "Standardized Test Scores and Alternative Assessments: Different Pieces of the Same Puzzle," by university researchers, William Loadman and Anne Marie Thomas (page 18).

Next come articles about alternative assessment techniques straight from the classroom. Jennifer Williams tells how portfolios and student-led parent conferences took a middle school by storm (page 21). Paul Hickman describes how to use technology to assess student understanding (page 24).

Can elementary school students assess their own learning? Margaret Riddle shows they can (page 28). Bill Heinmiller shares student journal entries and explains how they helped him assess his students' learning and his teaching (page 31).

The second group of articles presents many different viewpoints about the standardized tests that teachers must face in the real world of schools. In these pages, you'll hear from the Educational Testing Service (page 34) and the American Association for the Advancement of Science (page 47), from a state senator who enacted proficiency testing legislation (page 42) and from a well-known educational author who thoroughly disapproves of such legislation (page 43).

You'll also hear from two teachers separated by a continent (they are from Vermont and Washington state) but similar in their desire to turn their states' assessment programs into a positive force in their classrooms (pages 35 and 45). See page 41 for an article that helps put the Third International Mathematics and Science Study (TIMSS) into the classroom context.

We hope all the articles in this issue—those dealing with standardized testing and those describing classroom techniques—fulfill our goal to help you consider how assessment can inform your practice.

As always, we invite you to share your views on this or other educational issues. If you would like to voice an opinion, please contribute to ENC's Innovators' Forum. (See page 7.) Or maybe you are experiencing marvelous successes in your classroom. Please tell other educators all about it in an article. Upcoming topics are listed below; our complete writers' guidelines are on page 15.

Upcoming ENC Focus Topics and Deadlines

- *Partnerships with Business and the Community*
  Submissions due June 1, 2000
- *The Standards-Based Classroom*
  Submissions due September 1, 2000
- *Building Literacy in Mathematics and Science*
  Submissions due December 1, 2000

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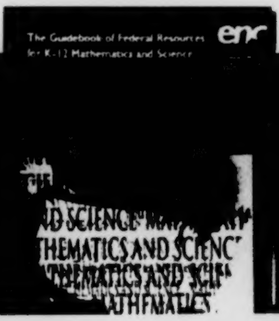
The electronic version of ENC's Guidebook to Federal Resources for K-12 Mathematics and Science has recently been updated for the year 2000.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ENC's Partners:

NCTM's *Principles and Standards for School Mathematics*

In each issue, *ENC Focus* features one of the many organizations that collaborate with ENC to promote educational improvement. This time we take a look at *Principles and Standards for School Mathematics*, scheduled to be released in April 2000 by the National Council of Teachers of Mathematics (NCTM).

by Leah Poynter, ENC Publishing

NCTM published the *Curriculum and Evaluation Standards for School Mathematics* in 1989. This important document was followed by two related publications—*Professional Standards for Teaching Mathematics* (1991) and *Assessment Standards for School Mathematics* (1995). All three of these publications promoted a bold vision for improving school mathematics.

A little more than 10 years later, the next generation of NCTM *Standards* sets the stage for the continued improvement of school mathematics in a new decade and a new century. Important information has been learned since the release of NCTM's first *Standards* document. New research on the teaching and learning of mathematics, advances in technology, and the changing mathematical needs of our students have helped redefine how mathematics should be taught. NCTM's new publication, *Principles and Standards for School Mathematics*, provides an updated description of what students should know and be able to do in mathematics classrooms.

THE UPDATED STANDARDS

The draft version of *Principles and Standards for School Mathematics* presents 10 standards—number, measurement, algebra, geometry, data analysis, problem solving, reasoning, connections, communications, and representation—that span grades preK-12.

The document features four grade bands (preK-2, 3-5, 6-8, 9-12); each grade-band chapter shows how the 10 standards interplay. Within each standard, focus areas are defined and expanded. Sample problems, classroom vignettes, and examples of student work are also included. In addition, the grade-band chapters indicate points at which levels of mastery, or closure, are appropriate.

NCTM assembled an Electronic Format Group to design new ways of distributing the *Standards*. The group developed an electronic version that includes a rich collection of examples and links to online resources. ENC Director Len Simutis served as a member of this group, and ENC staff made additional contributions such as helping to develop a search mechanism for finding curriculum resources in the ENC collection that correspond to each of the *Standards*.

In addition, the Electronic Format Group created the Illuminations web site (illuminations.nctm.org) that includes extended examples, or illuminations, to illustrate the concepts described in the Standards 2000. The site also contains a collection of selected web resources that support the Standards. The Illuminations site was developed in collaboration with MCI WorldCom as part of the MCI MarcoPolo program. MarcoPolo provides free professional development information about integrating the Internet into the classroom, with standards-based content for many subject areas.

Guiding Principles

The new name, *Principles and Standards for School Mathematics*, highlights one of the most significant changes in the updated document. Six guiding principles now provide basic tenets on which to establish quality mathematics instructional programs.

Principle One: *Equity*
Mathematics instructional programs should promote the learning of mathematics by all students.

Principle Two: *Mathematics Curriculum*
Mathematics instructional programs should emphasize important mathematics that can be made meaningful to students through curricula that are coherent and comprehensive and that develop both depth and closure for mathematical ideas over the grades.

Principle Three: *Teaching*
Mathematics teaching should enable students to learn and should be provided by competent, caring, and qualified teachers.

Principle Four: *Learning*
Mathematics instructional programs should enable students to understand and use mathematics.

Principle Five: *Assessment*
Assessment should monitor, support, and evaluate the mathematics learning of all students and judge the extent to which the goals of mathematics instructional programs are achieved.

Principle Six: *Technology*
Technologically enriched mathematics instructional programs should provide all students with access to new and important mathematical ideas and to new ways of viewing mathematical activity.

THE WRITING PROCESS

Updating the *Standards* was a multiyear process that had been planned since the inception of the first NCTM *Standards* document. In 1996, NCTM put together a commission to begin the process of updating the material. The next step was forming a writing group with expertise from classroom teachers, mathematicians, curriculum developers, and university professors.

The writing group built on the foundation of the original *Standards* and consolidated ideas about curriculum, teaching, and assessment from the original publications into a single document. The group gathered input from many professional communities including NCTM members and educational and mathematics association review groups.

ENC sponsored two conferences in 1998 to discuss the updated *Standards* and the role of technology in math education. Many additional resources, including state and international frameworks and curriculum materials, were collected to inform the writing process.

NCTM released the discussion draft of the *Principles and Standards for School Mathematics* in October 1998, providing a year's time to discuss the updated document. More than 650 individuals sent feedback. Ten groups from education and mathematics associations and 70 special discussion groups also sent in responses.

RELEASING THE STANDARDS

Principles and Standards for School Mathematics is scheduled for release at NCTM's 78th annual meeting in Chicago. NCTM members with current memberships as of April 1, 2000 will receive a free copy by mail in May. For more information and access to the electronic version of the Standards, visit the NCTM web site (nctm.org) or the Illuminations site (illuminations.nctm.org) ●

Innovators' Forum Online

While no one has answers for all the issues facing educators today, progress is possible when classroom innovators, like yourself, exchange ideas.

To make such an exchange possible, the online version of *ENC Focus: A Magazine for Classroom Innovators* (enc.org/focus/) features an electronic Innovators' Forum. Readers are invited to send concerns and comments via email to editor@enc.org. Selected messages will be published online, and of those, a few will appear here, so that readers of the print version of the magazine can participate.

> In light of this issue's topic, Assessment That Informs Practice, we publish an administrator's suggestion for preparing students to succeed on state proficiency tests:
>
> ***Dear Innovators,***
>
> *My school district is perennially at the bottom of the list (635 out of 640 school districts) in the percentage of students passing our mandated state assessments at fourth, eighth, and eleventh grade levels. The depth of information required of our students indicates that a more indepth level of subject matter study is needed at grade levels earlier than middle school.*
>
> *There are some school districts that are departmentalized as early as fifth grade, and subject matter specialists are used for instruction. With the ever-expanding level of knowledge that students are expected to master, is it time that we all focused on subject matter specialty beginning no later than fourth grade?*
>
> *Sylvia W. Stewart, Vice Principal*
> *Ohio Avenue (Eighth Grade) School*
> *Atlantic City, New Jersey*

Please keep in mind that Innovators' Forum offers a way for you to discuss issues with other classroom innovators. You can get information and answers to many educational questions from ENC's Information Services Department. Contact them by email library@enc.org or telephone (614) 292-9734.

When you contribute to Innovators' Forum, please include your full name, your title or the grade you teach, the name of your school or district, and your city and state. Please note that comments selected for publication may be edited for brevity and clarity and that by submitting them you are giving permission for your comments to appear in both the print and the online versions of this publication.

Again, the *ENC Focus* email address is editor@enc.org. Or send your comments by mail: *Focus* Editor, ENC, The Ohio State University, 1929 Kenny Road, Columbus, OH 43210-1079. If you send a letter, please include your telephone number so we can contact you if necessary.

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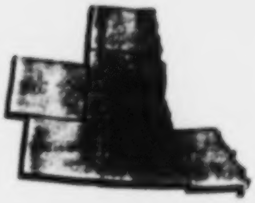

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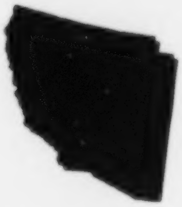

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Southwest Region
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consortium

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URL: www.gwu.edu/~immc/

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ENC in Action:

Tools for Enhancing Professional Development

This teacher educator relies on ENC's electronic and print resources to support the professional growth of all the teachers in her district.

by Nancy Grimes, Professional Development Facilitator, Waterloo, Iowa

Three years ago, I started facilitating mathematics and science professional development in my district and led a team of teachers to the Iowa Governor's Academy for Mathematics and Science Education. Each team received many resources from ENC for our professional collections. Upon returning home from the Institute, I immediately bookmarked ENC Online (enc.org).

Since that time, ENC has become a valuable resource for our district. It has been the main reference and starting point for many searches. During introductory Internet classes for our mathematics and science teachers, we highlighted ENC Online. While our teachers were learning to navigate the web, they probed the site and immediately found lesson plans and materials to use with their students. The quality of the materials helped many reluctant Internet users become less intimidated, and they now visit the site regularly.

In addition to the information on the web site, ENC provides useful printed materials. *Ideas that Work: Mathematics Professional Development** is one of the best resources available on guiding staff development practices. Fifteen strategies are thoroughly defined with recommendations for specific use. Following the advice in this guide, we began to offer our staff more varied professional development opportunities.

Another publication we have found useful is the newly revised *ENC Focus: A Magazine for Classroom Innovators*. After we received our first copy, we immediately circulated a photocopy of the subscription form to teachers and principals. The organization and usefulness of the magazine are most impressive.

ENC Focus alerted me to one of ENC's newest offerings, the professional development web site, Teacher Change: Improving K-12 Mathematics, (change.enc.org). What a wonderful resource!

The Eisenhower National Clearinghouse truly embodies its mission. ENC's curriculum resources, high-quality professional development materials, and dissemination of useful information and products have greatly enhanced mathematics and science education for our staff and students. ●

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Ideas Work
Science
Development

**Editor's Note: In addition to* Ideas that Work: Mathematics Professional Development, *ENC also publishes* Ideas that Work: Science Professional Development. *Both booklets are available free while supplies last or see full text online at enc.org*

See Your Story on this Page!

Do you have a story about how you used ENC products or services? Please email it to us at editor@enc.org or mail to Focus Editor, ENC, The Ohio State University, 1929 Kenny Road, Columbus, OH 43210-1079.

Using the Internet

School and Home Connect Through the World Wide Web

In each issue, ENC's Associate Director of Instructional Resources writes about her experiences using the Internet as an educator. This time, she adds a parent's perspective.

by Kimberly S. Roempler, Instructional Resources

Parents will be interested in the National Educational Technology Standards developed by the International Society for Technology in Education (ISTE), which ENC published in the Integrating Technology in the Classroom issue of *Focus*. Visit enc.org/focus/edtech

A wonderful way to get parents or other caregivers involved in their children's learning is through the World Wide Web. My daughter, Kelly, and I have spent many enjoyable hours in front of the computer. Resources found on the web can inform and extend what is taught in Kelly's third grade classroom. Perhaps even more important, I know Kelly is learning valuable technology skills that she will need throughout her life.

More and more parents have web access either at home or through the local library. Students and parents can work together to learn how to search the web. In addition to mining the Internet for "gems," they benefit by spending valuable time together.

Teachers can encourage this exploration by developing their own classroom web sites that inform students and parents what is happening in their class. Teachers can also make a point of collecting helpful web sites to recommend to parents.

In the next issue of *Focus*, this column will deal with the issue of developing a class web site. This time, the article describes web sites that will help parents learn about the Internet and sites that can supplement what is taught in the classroom. Addresses for sites mentioned throughout the article—and more—are listed in Roempler's Recommended Resources.

GETTING COMFORTABLE WITH THE WEB

Helping parents feel comfortable using the web is often the first step. Teachers can direct parents, through newsletters or notes home, to sites that provide an introduction to the Internet. Schools can also provide parents with a crash course in WWW basics during open house. And we never should overlook students. Many youngsters have the skills to take on the role of teacher and help parents navigate the web.

Parents also need guidance in searching and becoming critical consumers of what the web has to offer. When teachers highlight sites that have their approval, parents feel confident to dive right in. Even though I know a lot about the web and its resources, it is still helpful when Kelly's teacher mentions sites that she thinks are appropriate—those are the sites we visit first.

I also appreciate search tips from the technology teacher at Kelly's school. For example, she recommends the kid-friendly Yahooligans and AskJeeves for Kids search engines. They are the only search sites I know of that have been screened to make sure all content is appropriate for children. The search engine Google.com has not been screened for use by children working alone, but it is so powerful I would highly recommend it for teachers and parents.

SUPPLEMENTING SCIENCE AND MATH CONTENT

Even though Kelly and I still use print resources for school projects, more and more we rely on the Internet for information not easily found in traditional media. For example, she enjoys learning math facts at A+ Flashcards or reading information at Ranger Rick's BatBits site. (Doesn't every third grade class do a unit on bats?)

Where can teachers go to find sites to recommend to parents to extend the learning in the classroom? ENC Online's list of Digital Dozen award winners is a good place to start. On the Digital Dozen page, you can search the set of web sites that have won the award. Type in a topic such as meteors or reptiles, and a short list of highly rated sites will be returned. These sites have been reviewed by ENC's experts in the field of science and math education and are appropriate for a variety of grades.

Youngsters always have a lot of questions, and parents (and teachers) don't always know the answers. Questions generated at all grade levels can be answered via The Mad Scientist Network and Pitsco's Ask An Expert sites. Students and parents who have questions about how CD players, copiers, or other machines work can get their questions answered on The Way Things Work web site. Homework Central is another site that can help students of any grade level.

YOU CAN HELP

ENC is always interested in hearing from teachers. This time, I invite you to contact me with web sites you have found to be particularly helpful to parents exploring the Internet with their children. I also would very much like to hear from teachers who have been successful in developing their own class web sites. Email me at roempler@enc.org

Roempler's Recommended Resources

Introduction to the Internet

ENC Online's Digital Dozen Award Winners - Since 1995, ENC's experts in mathematics and science education have selected 13 excellent sites each month. The list of all Digital Dozen winners is searchable by topic.
enc.org/classroom/dd/nf_index.htm

FamiliesConnect - This site is created for parents and children to use together. It offers families an opportunity to learn about the Internet and use it together.
www.ala.org/ICONN/familiesconnect.html

The Librarian's Guide to Cyberspace for Parents and Kids - Librarians have selected, organized, and categorized information to help families take best advantage of the vast resources the Internet offers.
www.ala.org/parentspage/greatsites/guide.html

Parents Guide to the Internet - This guide suggests how parents can allow their children to tap into the wonders of the Internet while safeguarding them from its potential hazards.
www.ed.gov/pubs/parents/internet/index.html

Getting Online: A Friendly Guide for Teachers, Students, and Parents - This site helps users figure out how to get online, describes some of the educational offerings available, and offers hints to help make families' web exploration easy and successful.
www.accesseric.org/resources/online/index.html

Search Tools

Ask Jeeves for Kids - A "safe" web search tool that allows young people to ask questions in everyday language.
www.ajkids.com

Yahooligans for Kids - Another screened search engine that children can use on their own.
www.yahooligans.com

Google.com - Not screened for use by children, but a very powerful tool for teachers and parents.
www.google.com

Especially for Parents

National Parent Information Network - Resources for Parents
ericps.ed.uiuc.edu/npin/respar/texts.html

What Does School Reform Mean to My Neighborhood School?
www.accesseric.org/resources/parent/schrefor.html

What Should Parents Know About Standardized Testing in Schools?
www.accesseric.org/resources/parent/testing.html

What Should Parents Know About Performance Assessment?
www.accesseric.org/resources/parent/pba.html

Helping Your Child Series - This series includes topics such as science, math, reading, and homework. Some are available in Spanish.
www.ed.gov/pubs/parents/hyc.html

American Library Association Resources for Parents, Teens, and Kids
www.ala.org/parents

Family-Friendly Sites

Homework Central
www.multnomah.lib.or.us/lib/homework/index.html

The Franklin Institute
sln.fi.edu

Surfing the Net with Kids
www.surfnetkids.com

The Exploratorium
www.exploratorium.edu

NASA Space Science News
science.nasa.gov

The Ways Things Work
landau1.phys.virginia.edu/Education/Teaching/HowThingsWork/topics.html

A+ Flashcards
www.aplusmath.com/Flashcards/index.html

Ranger Rick's BatBits
www.nwf.org/nwf/rrick/batbs96.html

Ask-An-Expert Sites

Mad Scientist Network - Search the archive of over 2000+ answered questions. Warning: they take at least a week to answer, so don't ask them the night before your homework is due.
www.madsci.org

Pitsco's Ask An Expert - This kid-friendly site connects you with hundreds of real world experts, ranging from astronauts to zookeepers.
www.askanexpert.com

JUMP ONLINE!

Link to all of these sites via enc.org/focus/assessment

Going for Grants

The Grantwriter's Bookshelf

In the last issue, this column featured web-based resources for grantseekers; this column describes some helpful print resources. See all of the Going for Grants columns by clicking Departments at enc.org/focus.

by Tracy Crow, ENC Publishing

What does the public library have to offer the teacher seeking funds to support classroom innovations or professional development projects? While a reference librarian can help you navigate all types of research, the library shelves hold a number of recent books that are useful for grantwriters.

The resources profiled here are not intended to be representative of the entire world of grantseeking books! These were among those readily available at our city's main library. Your library may have some of the books described here, or you may be able to track them down at a local bookstore or online.

The Teacher's Guide to Winning Grants

DAVID G. BAUER, 1999, JOSSEY-BASS

This is the only guide on our library's reference shelves that was specifically targeted to teachers. Most books are geared to community or social service organizations, but they will also be of interest to teachers.

Bauer sets the context for the guide by describing the reasons that teachers get involved in grantseeking. One of the book's early chapters is titled Demystifying the Grants Process; throughout the guide, Bauer avoids jargon and plainly explicates the different steps to writing a proposal. The scope of the book ranges from the initial stages of research—for example, finding appropriate funders—to proposal preparation and, finally, submission details.

The guide is specific and practical with useful worksheets and checklists. One activity, for example, covers what to do with a grants advisory group. Another helps a group determine its needs precisely and determine where the real gaps lie. The guide helps you create a project planner along with a timeline and a budget. Sample scoring sheets allow you to anticipate how the proposal will be reviewed.

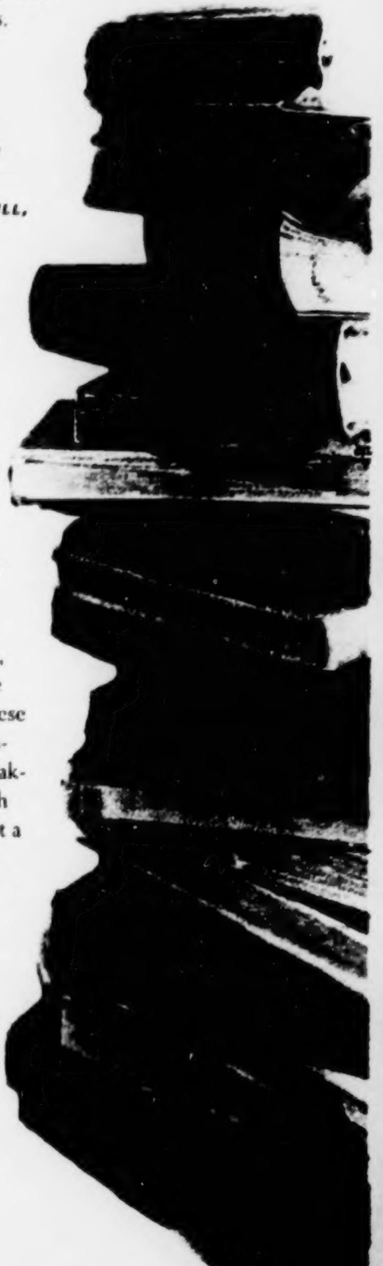
Bauer has written a similar guide that covers grantseeking issues for school principals.

The Foundation Center's Guide to Proposal Writing, Revised edition

JANE C. GEEVER & PATRICIA MCNEILL, 1997, FOUNDATION CENTER

This proposal-writing guide walks the reader section-by-section through the different parts of a proposal. Specific examples from actual proposals illustrate each step. This book focuses on the writing portion of fundraising; the authors stress that this is just one aspect of the process.

The information contained in this guide is based on interview sessions with 21 funding representatives. Excerpts from the interviews, included in an appendix, provide a sense of the perspective of the funders. It is enlightening to see how these funding representatives respond to questions on such topics as trends in grantmaking, how to make a good initial approach to a foundation, the best ways to present a budget, the best and worst things to do after receiving a grant or being turned down, and pet peeves.



Secrets of Successful Grantsmanship: A Guerrilla Guide to Raising Money

SUSAN L. GOLDEN, 1997, JOSSEY-BASS.

The philosophy of this book is explained in the first chapter—What They Don't Tell You in Grantsmanship Workshops. Golden focuses on the relationship model of grantseeking: the funder is a customer with whom you must build a meaningful relationship. The proposal is just one part of a continuous process.

A unique aspect of this book is the attention paid to establishing that relationship. There are examples of conversations that can and should take place between funder and grantseeker. You'll read about how to write preliminary concept papers and letters of interest and what to say on first phone calls to potential funders. Different types of meetings are described, along with who should attend and why, and even how to dress. Scenarios of relationships with funders are depicted, with advice about when to prepare a proposal and when not to waste your time.

Finally, the book stresses that your relationship with a funder is not over when a proposal is presented. Golden believes that as much as 25 percent of your fundseeking time and resources should be spent after the proposal is submitted.

Grantseeker's Answer Book: Grants Experts Respond to the Most Commonly Asked Questions

JACQUELINE FERGUSON & MICHAEL GERSHOWITZ, 1995, CAPITOL PUBLICATIONS

Two grants specialists with extensive experience in fundraising offer answers to common questions about grantwriting. The questions and answers in this useful supplementary guide are arranged under several categories with headings such as Team Building, Funder Contact, Federal Agencies, and Overcoming Problems.

Sample questions include:

> "How can we work with a team to develop grant proposals?"
>
> and
>
> "How can we prevent negative press coverage from becoming a grantseeking disaster?"

The answers are concise yet thorough. With its wide-ranging coverage of topics, this would be a good supplement to one of the step-by-step guides.

The "How To" Grants Manual: Successful Grantseeking Techniques for Obtaining Public and Private Grants, Fourth edition

DAVID G. BAUER, 1999, AMERICAN COUNCIL ON EDUCATION AND THE ORYX PRESS

Written by the author of the *Teacher's Guide*, described on page 13, this book addresses similar topics in greater depth. This is one of the more comprehensive guides, covering planning, researching, identifying sources, submitting proposals, contacting funders, and following up. The book emphasizes proactive grantseeking as a continuous process.

Here's one example of the depth of this manual: it covers six approaches to assessing and documenting needs for a project, along with the advantages and disadvantages of each. Like the *Teacher's Guide*, this book provides specific suggestions on how to conduct brainstorming and other group meetings.

Grants, Etc. Second edition

ARMAND LAUFER, 1997, SAGE PUBLICATIONS

The primary audience for this book is development personnel or professional grantseekers. However, the book provides helpful information for teachers and other educators who are beginning to think beyond grants for sources of funds, services, or equipment to support their projects.

General philanthropy information is covered, along with proposal development information. The book stresses a marketing orientation to establishing relationships (like the *Guerrilla Guide*). While this is not as detailed on the parts of a proposal, preparing forms, and so forth, the book would be quite helpful for expanding your searches beyond the most commonly emphasized categories of grantseeking. ●

JUMP ONLINE!

Link to all the sites mentioned in this magazine by visiting the online version of *ENC Focus:* enc.org/focus/assessment/

Writers' Guidelines for *ENC Focus*

GUIDELINES FOR CONTENT OF ARTICLES

ENC publishes print and electronic materials on specific topics of interest to teachers of K-12 mathematics and science. Articles submitted for consideration should be grounded in the national educational standards while being short (500 to 2,000 words) and compelling. It is essential that articles promote educational equity and advance of the principle of "education for all."

We particularly invite teachers to write about their classroom experiences, using first person and a conversational tone. Please note that library research papers written in academic language for graduate school courses are unlikely to be selected for publication. We do, however, encourage you to include a few, carefully chosen references or a brief reading list. All content must be original, and all quotations must be properly cited.

We also publish essays by K-12 students about their successes in mathematics and science. Teachers are encouraged to assist students in writing and submitting materials for publication.

ENC is not interested in publishing articles that have the main goal of promoting commercial products.

GUIDELINES FOR PHOTOGRAPHS AND ILLUSTRATIONS

Photos or other illustrations add interest, and good illustrations increase your chances for publication. Photos should show students involved in an activity rather than looking directly at the camera. Students in laboratory settings must be shown following appropriate safety guidelines and wearing proper safety attire, including eye protection. Please select photos that depict diverse students and teachers working together.

Please note that we can use photos of children under 18 years of age only if we receive written permission signed by a parent or guardian. It is important that the form specify that permission is granted for use of the image on the Internet as well as in print. ENC will provide permission forms on request.

Photos, slides, negatives, drawings, or charts may be mailed to the editor. We prefer color, but black and white photos are also acceptable. Photos should be at least 4x6 inches. Tape an identifying label on the back of each item rather than writing on it. Photos and other illustrations or materials will be returned only on request. Keep in mind that we will not be able to return any material until after the magazine is printed.

If you would like to use a digital camera, please take photos at your camera's highest setting, which may be 1024x768 or 1240x960. You can then attach those photos to an email or send them to us on a disk. Scanned images need to be at least 300 dpi; the dimension of the image should be at least 4x6 inches. Save the images as jpeg files. Digital photos printed on photographic paper with an ink jet printer are not acceptable because the resolution is inadequate for reproduction.

SUBMISSION DETAILS

Authors of unsolicited manuscripts are urged to send a brief proposal via email well in advance of the deadline for the upcoming topic. Proposals should explain how the article fits the topic and how it serves the needs of K-12 teachers. Future topics and deadlines are regularly published in both the print and online versions of the magazine.

We prefer that manuscripts be submitted electronically. A Microsoft Word or text file attached to an email message works well. Manuscripts can also be submitted by fax or regular mail. Paper submissions must be typed in a large, clear font; this is especially important for those sent by fax.

Each manuscript must be accompanied by the full names, postal addresses, telephone numbers, and email addresses of all authors. In addition, each author must be further identified with one or two sentences providing the author's professional affiliation and background.

We cannot consider manuscripts that have been submitted elsewhere. Occasionally we reprint outstanding articles that have been previously published. Authors suggesting their own articles for reprint must provide written permission from the original publishers.

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THE EDITING PROCESS

Your proposal or manuscript will be acknowledged as soon as possible after it is received. Inclusion of your email address greatly speeds this response.

Please keep in mind that just because an article has been acknowledged does not mean it has been accepted for publication. Sometimes we cannot determine whether a particular article will be published until all articles for the issue have been edited.

All articles, solicited and unsolicited, are reviewed by ENC's mathematics and science education experts both before and after they are edited, and edited articles are reviewed by officials at the US Department of Education. At any step in this process, ENC reserves the right to decline to publish any article, to delay publication until a later issue, or to publish an article online and not in the print version of the magazine.

During the editing process, you may be contacted to answer questions about your article. Or you may just receive an edited version of your article for your approval. At this point we need an immediate response, even if the article is correct to print as edited.

Please keep in mind that articles may be changed significantly to suit the needs of our audience, to match our style, or to fit in the space available. We want the edited version to be factually correct and to express your views accurately, but ENC retains the right to make final editing decisions.

WHEN YOUR ARTICLE IS PUBLISHED

ENC mails five copies of the print version of the magazine to each author. Requests for bulk shipments of the print version will be filled while supplies last.

Upcoming topics and deadlines are listed on page 5.

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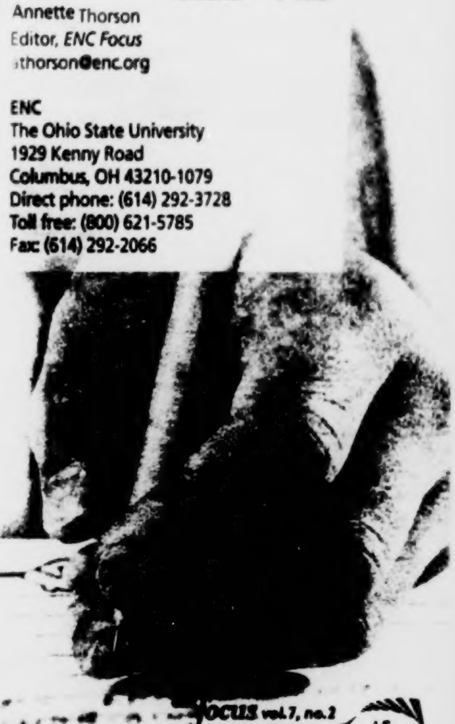

Focus on Assessment That Informs Practice

FACING—AND EMBRACING—THE ASSESSMENT CHALLENGE

ENC's new science education specialist bases her remarks about assessment on more than 20 years' experience as a high school teacher.

by Carol Damian, ENC Instructional Resources

The commotion about high-stakes tests (proficiency tests, standardized tests, achievement tests) is so prominent in the media these days that it would be easy to forget that such tests are not the only—or even the primary—way to assess student learning. A big part of the assessment picture is the collection of information that is taking place in our classrooms everyday. Assessment cannot be a once-a-year crisis; assessment must be viewed as the opportunity to gather information and insight about our students and their learning moment by moment. Assessment is embedded in every aspect of our planning, thinking, and doing.

This daily, embedded assessment is what we teachers are doing as we look across the sea of students to gauge understanding by the youngsters' facial expressions or their body language. We're assessing our teaching as well as their learning as we note the sort of questions they are asking, the ways they are approaching a problem. Creative methods to handle this almost constant and very demanding kind of embedded assessment are described by the classroom teachers who have contributed articles to this magazine (see pages 21-33).

I would also like to acknowledge the place of classroom assessment techniques that are more formal than the student journals, portfolios, and self-assessment rubrics used so successfully by these teachers. I believe classroom tests—either teacher-created or those provided with many excellent curriculum materials—allow us to judge whether we are meeting the curricular objectives set by our districts and ourselves.

Most teachers value and make good use of embedded assessment and classroom tests, but many are becoming skeptical of the role of the high-stakes, standardized tests that are now being mandated by at least 40 states in the United States. The most thoughtful discussion of this issue that I have read recently is Richard Stiggins' *Phi Delta Kappan* article, "Assessment, Student Confidence, and School Success." While Stiggins acknowledges that pressure from high-stakes tests can lead to productive work, he notes, "...conventional wisdom has been that the way to spur greater effort is through intimidation by means of the threat of dire consequences for low test scores." (p.192)

Unfortunately, in recent years, I have observed that the tests and their real (or imagined) results have indeed had negative repercussions. Disappointing test scores have triggered threats of teacher-transfer, advancement denial, punitive salary plans—or even dismissal of teachers or school principals.

Stiggins calls for a re-emphasis on classroom assessment, arguing:

> ...if assessment is not working effectively in our classrooms every day, then assessment at all other levels (district, state, national, or international) represents a complete waste of time and money.

However, no matter how much some people may agree with that statement, we know that state-mandated tests are not likely to go away in the near future. Thus, it is important that teachers find ways to use the tests to make our teaching better and our students' learning more meaningful. How can standardized testing become a positive force in education rather than a negative one? Several of the articles in this issue suggest answers to this question.

My own view is that educators need to emphasize that these tests are a source of research data. Research is a powerful tool for improving any "product," whether in industry, civil programs, or education. The scores and the raw data drawn from the test results for each student, each course, each teacher, each school, can be powerful bits of research-based information from which to draw future plans for educating students.

As a classroom teacher, I know if I never have access to reliable assessment about how my students' achievement compares with that of others across the nation and around the world, I'll never really know how they are doing in the broadest context. Standardized tests give me a window to the reality beyond my classroom, beyond my own measure of how things ought to be.

I feel confident that, interpreted thoughtfully, standardized test results can help provide a clearer view of that reality. In most cases, I have found that achievement tests are well designed, having passed all sorts of critical review by educators, professionals in the field, and the public. The tests are generally based on "big ideas" (for example, in science, tests cover systems, scientific models, behavior, and characteristics of matter) so that teachers can teach those ideas in a variety of ways. These carefully designed tests are not about specific questions and memorization of given facts—they are about broad-based learning and knowing how to think through problems and situations. Students will need such skills in their future. An educator can "teach to" these tests and be doing a very good job of educating.

There is a rather large gap between what I see as the present negative atmosphere surrounding standardized tests and the hoped-for change to an acceptance of test data as a tool for critical evaluation and planned improvement. The change depends on educators' and community members' looking beyond the surface of "student scores" into the rich body of information that test results can offer.

Education is always an experiment. Times change, students vary, communities have different needs. Our schools are constantly keeping an eye on these factors and, with careful experimentation, trying to do what is best to improve instruction and learning. Why, then, can we not use test data in this important experiment and find a way to make standardized tests enhance the embedded classroom assessment we value so much? We need to use all means available to create a well-rounded view of teaching and learning. In so doing we will reform education in a real way for students, teachers, administrators, and communities. ●

REFERENCE

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STANDARDIZED TEST SCORES AND ALTERNATIVE ASSESSMENTS:

Different Pieces of the Same Puzzle

Despite the ongoing debate, these two types of assessment do not need to be mutually exclusive; both can provide important information to teachers.

by William E. Loadman and Anne Marie Thomas, The Ohio State University

Far-reaching policies are often based on the results of state-imposed standardized testing programs. Concerned individuals, both in the educational community and beyond, have questioned this. The usefulness of these tests in terms of actual student assessment has been debated. The testing programs and their scores have been blamed for disrupting normal classroom learning and assessment. Often the tests are viewed as being one dimensional, biased, and simply not useful for classroom teachers (Haney & Madeus, 1989; Mehrens and Kaminski, 1989; Cattrel , 1991; Cooley, 1991; Darling-Hammond, 1991; Jaeger, 1991; Smith & Rottenberg, 1991; Stake, 1991; Lanese,1992; Mehrens, 1992; Popham, 1992; Herman & Golan, 1993).

Alternative assessment strategies, such as teacher observation, personal communication, and student performances, demonstrations, and portfolios, have been offered by experts as having greater usefulness for evaluating students and informing classroom instruction (Dorr-Bremme & Herman, 1986; Stiggins, 1994; Brookhart, 1999). In addition, the contentious atmosphere surrounding standardized testing has resulted in a backlash against that format and in favor of alternative or "authentic" strategies (Stiggins, 1994).

We would like to suggest to classroom teachers that standardized test scores and alternative student assessments both have an important place in our classrooms. Both offer different pieces of information about a given student. Teachers who are comfortable with both types of assessment have the ability to assess student knowledge, skills, and abilities more comprehensively.

UNDERSTANDING DIFFERENT TYPES OF ASSESSMENT

Both standardized testing and alternative assessment strategies are designed to assess student learning, but the purposes behind these two types of assessment frequently differ. Large-scale, high-stakes standardized tests do gather information about individual student performance, but most of these assessments are primarily designed to inform decision makers about performance on the school, district, and/or state level. On the other hand, alternative assessment strategies are more frequently used to provide information about individual students.

Beyond understanding the basic purposes of each type of assessment, teachers need to take into account two other important considerations.

The first consideration is a question of values. Assessment, whether reflected in a standardized test score or in a teacher-written description of a student performance, is based in subjective human value. People have different values. These differing values often lead to different evaluation criteria, which ultimately result in different final assessments.

The second consideration is the underlying reference model. There are three prominent models used in education:

- the norm-referenced model, in which individual student performance is compared with a norm group;
- the criterion-referenced model, in which individual student performance is compared to a standard or criterion; and
- the growth model, in which individual student performance is assessed by examining student growth on a concept, knowledge base, or skill between two points in time.

Lack of understanding of which model is being used in interpreting student achievement often confuses the debate over the merits of various assessment strategies.

Each of these considerations is pertinent for both standardized test scores and the interpretation of alternative assessments.

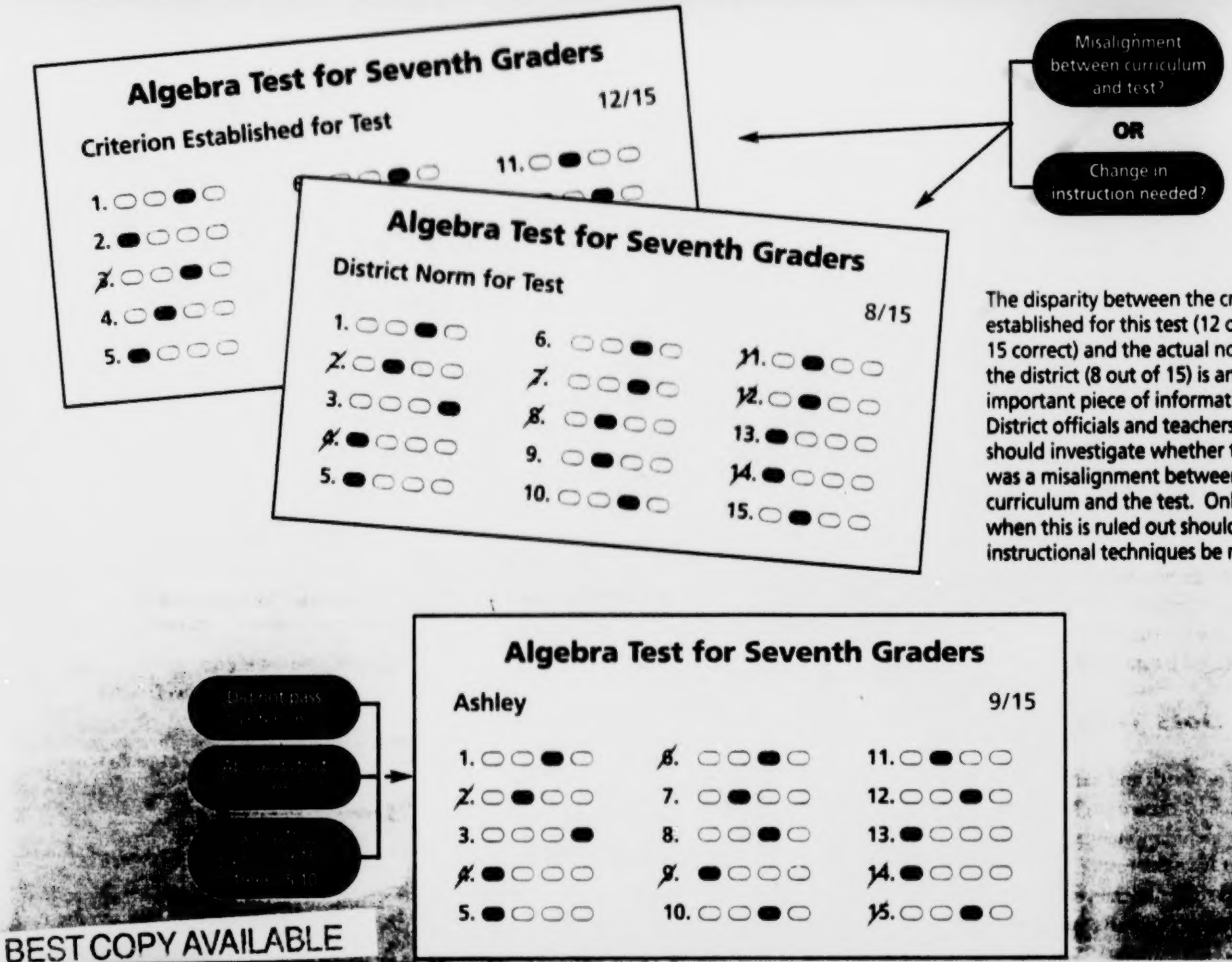
WHAT STANDARDIZED TEST SCORES CAN TELL US

Standardized test scores properly obtained through a valid and reliable instrument and used appropriately can offer a wealth of information. For example, to evaluate mathematics achievement in algebra, students could be asked to solve 15 different algebra problems. The criterion might be set that seventh graders should be able to solve 12 out of the 15 correctly to meet the standard for achievement in algebra. The same test might also be referenced normatively. Perhaps the school district average for algebra achievement among seventh graders was solving eight problems. Finally, if these standardized test measures on algebra were gathered over time or across grade levels, the assessment of growth is possible.

We illustrate the possibilities by looking at one student, Ashley, who solved nine out of the 15 problems correctly. In a similar assessment taken when she was in sixth grade, Ashley solved five out of ten algebra problems. Given the reference points, the teacher has valuable information about Ashley. She did not meet the criterion, but she did perform better than the district average, and it appears that she has grown from the previous academic year. All three pieces of information should be shared with Ashley and her parents so that the fact that she did not meet the criterion is not interpreted as academic failure.

The reference points also provide information on the level of achievement in the district. The fact that the norm for the district was below the criterion achievement level certainly is a cause for concern. Perhaps there is some curricular misalignment. The

Thinking About Standardized Test Results


Algebra Test for Seventh Graders
Criterion Established for Test
12/15
Misalignment between curriculum and test?
OR
Change in instruction needed?
Algebra Test for Seventh Graders
District Norm for Test
8/15
Did not pass
Algebra Test for Seventh Graders
Ashley
9/15

The disparity between the criterion established for this test (12 out of 15 correct) and the actual norm in the district (8 out of 15) is an important piece of information. District officials and teachers should investigate whether there was a misalignment between the curriculum and the test. Only when this is ruled out should instructional techniques be revised.

It is important to share all information with Ashley and her parents and avoid focusing on her failure to meet the criterion.

match between the district algebra curriculum and the algebra items on the exam should be examined before teachers make any drastic changes in classroom instruction. If there is a match, delivery of the material could be modified for the next year. A mismatch would suggest that district leadership should review both the curriculum and the test.

WHAT ALTERNATIVE ASSESSMENTS CAN TELL US

Alternative assessment formats, such as teacher observation, personal communication, and student performances, demonstrations, and portfolios, offer students and teachers a forum where the knowledge or skill to be assessed is grounded in the kind of work people actually do in the real world (Wiggins, 1989). Moreover, the varied formats offer additional and, in many instances, more comfortable ways for students to demonstrate what they know and are able to do.

For example, if we turn to Ashley again, it could be that she has algebra knowledge and skills that were untapped by the paper-and-pencil format of the standardized test. Alternative algebra assessments could allow for that discovery. Perhaps an algebra game would show that Ashley can solve 14 out of the 15 problems correctly. Or direct communication with the teacher might result in Ashley getting all 15 correct.

Formats such as personal communication or teacher observation also offer teachers information on their curricula and their instruction. A teacher might believe she has covered all the terminology necessary for the students to demonstrate algebra skills. However, during a student demonstration, she realizes that the term "variable" had not been clear during the instruction.

Given the opportunity, students can become actively involved in assessment of their own performance and of the curriculum and instruction. For example, students might communicate that the instruction contradicted items on the test.

Pieces of information such as these would not have been available through a paper-and-pencil standardized test. Alternative assessments have been criticized as not being objective enough and not being generalizable, but they offer a new dimension as well as the opportunity for successful performance by students who may be disadvantaged by standardized tests.

WHAT DOES THIS MEAN FOR TEACHERS?

Multiple methods and perspectives must go into the assessment of students by classroom teachers. Use of all assessment tools available, including standardized test scores, is imperative. We as educators have the responsibility to build reliable portraits of individual student achievement and to use that information to shape both curriculum and instruction. ●

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Implementing Portfolios and Student-Led Conferences

This middle school teacher devised an assessment strategy that caught on with teachers of all subject areas.

by Jennifer Williams, Science Teacher, Eden Prairie, Minnesota

Learning about alternative assessment methods during graduate school inspired me to implement portfolios in my classroom. There are many different kinds of portfolios that are appropriate for use with K-12 students; just a few are listed in the sidebar A Potpourri of Portfolios.

In my work with my own students, I decided that portfolios would be a collection of student work or artifacts that is self-evaluated and reflects the learner's skills and thinking. I emphasize to students that their portfolio should show growth in their learning. Building portfolios invites students to communicate with teachers, peers, and parents while increasing their confidence and self-esteem. Students grow as they take responsibility for evaluating their own learning.

Preparing for Portfolios

As I committed myself to using portfolios with my students, I realized that I had much to learn. I contacted teachers and area education consultants who had experience using portfolios. I gathered research articles that I would later share with other staff members and parents. (See the Suggested Readings list on page 23.)

A four-drawer filing cabinet and three-ring binders for 100 students were donated so that I could organize and store my students' work. As part of their weekly or bi-weekly classroom routine, my students collected graded assignments and stored them in a "work-in-progress" manila folder. These folders were kept in the filing cabinet where they were easily accessible to students.

Initially, I assumed students would be able to reflect on and evaluate their own work with little effort. I was quickly proven wrong. Self-evaluation is a skill that must be taught.

To help them get started, I developed Guidelines for Portfolio Reflection. (See sidebar on page 23.) Using the questions and start-up phrases, students write their reflections on half-sheets of notebook paper or on sticky notes that they attach to their work. Once several pieces have been reflected upon, students organize this work in their binders, turning them into portfolios to showcase to teachers, peers, and parents.

Jennifer Williams currently teaches science at Central Middle School in Eden Prairie, Minnesota. She has presented her ideas about using portfolios and student-led conferences at regional and national meetings.

A Potpourri of Portfolios

Personal Portfolios

- **The Total Portfolio or "Me, Myself, and I"**—Items from outside of school may be included in this portfolio to form a more holistic picture of the students. Hobbies, community activities, musical or artistic talents, sports, families, pets or travels may be included in this type of portfolio. This type of portfolio allows classmates and the teachers to know more about students and to celebrate interests and successes outside the traditional confines of the school.
- **My Best Work or "My Top Ten List"**—The purpose of this type of portfolio is to allow students to select entries from all the work they have done. Emphasis is given to student choice. Teachers, parents, and students can review the work and see student's growth and development.

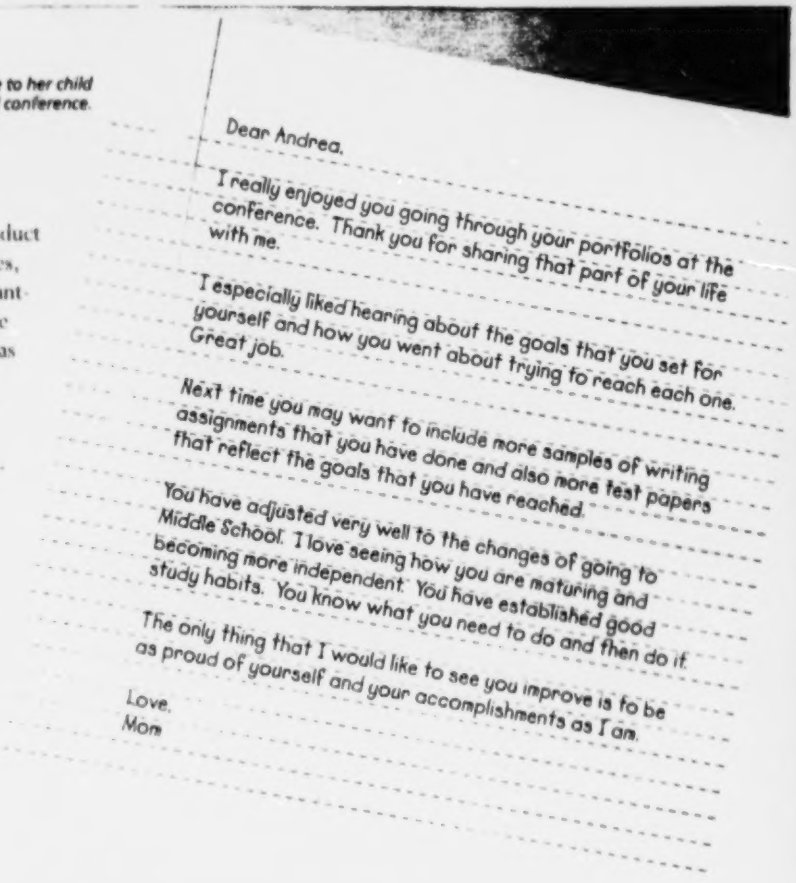
Academic Portfolios

- **The Graded Portfolio**—None of the specific items in the portfolio may be graded by the teacher or they may have been graded before they became a part of the portfolio. Once items are incorporated in the final portfolio, they still may be graded separately on the basis of predetermined criteria and scoring rubrics, or aspects (cover, organization, reflections, self-evaluation, goals) of the whole portfolio may be graded.
- **The Integrated Portfolio**—The purpose of this type of portfolio is to allow the student, teacher, and parents to view the whole student by seeing a body of work from all the disciplines and to show connections between or among the subjects included. The students select items from several or all of their subjects.
- **Cooperative Group Portfolio**—Each member of the cooperative groups contributes individual items that showcase individual strengths.
- **Multi-Year Portfolio**—This portfolio encompasses learning over several years. Periodically, students review all work and reflect on how much they have improved over a period of time.
- **Multiple Intelligence**—This portfolio includes activities and assessments from Gardner's seven intelligences.
- **Portfolio of Intelligent Behavior**—Collected work focuses on evidence of persistence, empathetic listening, flexibility in thinking, metacognitive awareness, problem posing and solving.

Group Portfolios

- **Class Profile**—Each class compiles items that reflect the accomplishments and personality of the class as a whole.
- **School Profile**—A schoolwide portfolio is kept by principals and staff members to chronicle the school year.
- **Time Capsule**—A collection of items documents the history of the school for future generations.
- **District Profile**—A cumulative portfolio contains contributions from each of the schools as well as districtwide events.

A letter one parent wrote to her child after the student-led conference.



Dear Andrea,

I really enjoyed you going through your portfolios at the conference. Thank you for sharing that part of your life with me.

I especially liked hearing about the goals that you set for yourself and how you went about trying to reach each one. Great job.

Next time you may want to include more samples of writing assignments that you have done and also more test papers that reflect the goals that you have reached.

You have adjusted very well to the changes of going to Middle School. I love seeing how you are maturing and becoming more independent. You have established good study habits. You know what you need to do and then do it.

The only thing that I would like to see you improve is to be as proud of yourself and your accomplishments as I am.

Love,
Mom

Sharing Portfolios

One way for students to showcase their work is to conduct student-led parent conferences. During the conferences, students share their portfolios. Students are held accountable for their learning and have evidence to support the grades they have earned. Each student's strengths, areas for improvement, and future goals become integrated throughout the child's dialog with his or her parents. Work samples also provide evidence that the child is making progress toward meeting state graduation standards.

Typically during teacher-parent conferences, the teacher does almost all the talking. Often, the student is not present. But in student-led conferences, the teacher is there to support and encourage the child. It is gratifying to hear the students describe their work, acknowledging their growth and learning.

Changing from the traditional to an innovative conference style takes time and practice. Before the first conference, I allow students to practice with their peers.

I also have learned to educate parents early about the rationale of portfolios and student-led conferences. Clear explanations—a letter combined with informational portfolio sessions early in the school year—help them accept this process and encourage their child.

I have found that parents want their child to be accountable for the grades they earn. I am so pleased when parents direct their conversation toward their child during the conference. Parents know that they are welcome to sign up for a separate conference without their child, but these are seldom necessary.

After the parent conference, the portfolio is taken home for further review. The students and I develop questions they would like their parents to respond to regarding their portfolios and conferences. Parents include their answers in a follow-up letter addressed to the child. (See the sample of a real letter one of my students received.)

In my classroom, student-led conferences are conducted twice per year, once in October and again in March. At the end of the year, we hold a portfolio fair. Students become more confident and proud of their portfolios as the school year progresses.

A Contagious Idea

Implementing portfolios and student-led conferences is a gradual process, but once these ideas are in place, they are contagious. Once one teacher or team begins, others will follow.

I started using portfolios four years ago. At first, the idea was confined to my team of students; now the entire school uses portfolios. To support the process, three-inch binders with the school name and mascot on the cover were purchased for every child. This year, for the first time, the portfolios have been passed on to the next grade level.

Student assessment often is a negative experience for all involved. Our school's experience with portfolios shows it does not have to be that way. Allowing students time to reflect on their progress and to communicate what they have learned is a step in the right direction. ◉

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The online version of this article includes a much more extensive list of both print and Internet resources pertaining to portfolios. Visit enc.org/focus/assessment/

Guidelines for Portfolio Reflection

Sentence completion:

- I think I did a better job on this work because...
- This piece shows that I had to solve a problem by ...
- Looking at everything in my portfolio, this is my favorite piece because...
- This is my worst piece because...
- This piece was easy to complete because...
- This piece shows my research skills by...
- On a scale from 1-10, I give this piece a ______ because...
- This piece could win an award for _______ because...
- The next time I write something like this, I will improve it by...
- This piece was the most frustrating because...
- This piece shows my creativity because...
- This piece shows that I need to practice...
- This piece may surprise people because...
- The next time I write something like this, I will...

Questions:

- What future goals do you have for this course?
- What do you want to tell me about this piece?
- How did you think of your idea for this project?
- How did others help you with this project?
- If you could redo this work what would you change?
- What would make this a complete piece?

Choose a piece that—

- was really hard and tell why.
- shows something you can do now that you could not do well before.
- you would want to look at in the year 2005 and tell why.
- shows your organizational abilities.
- reflects your problem-solving skills.
- shows your personal best.
- demonstrates your self-evaluation skills.
- shows how you evaluated someone else's work.
- illustrates change in your skills: reading, writing, observation, mathematics.
- was most interesting to you.
- shows your ability to work together with others.
- you did not do very well on.
- shows particular areas or skills you need to work on.
- went beyond the expectations of the assignment.
- shows how you solved a problem using more than one strategy.
- you revised.

ASSESSING STUDENT UNDERSTANDING

with Interactive-Collaborative-Electronic Learning Logs

A veteran science teacher describes how technology enhances communication between student research groups and their teacher.

by Paul Hickman, Center for the Enhancement of Science and Mathematics Education (CESAME), Northeastern University

> "...the most powerful educational application of computers may not be to use them as tools. Rather, using their capacities for simulation, for assisting reflection and self-evaluation, and for visual display of data may prove to be even more productive."
>
> —Allan Collins, Principal Scientist, Bolt, Beranek and Newman, Inc.

It is said that the process of writing makes thinking visible both to the writer and the reader. Through analyzing what and how my students wrote, I learned about their initial knowledge, thought processes, alternative conceptions, and other factors associated with their learning. This action research data was applied to improve the content of my lessons and the teaching methods I used.

ICE (Interactive-Collaborative-Electronic) learning logs attempt to combine the best of journal writing and portfolios. They are:

- **Interactive** between students within the group and between the group and the teacher who responds to their entries.
- **Collaborative** since students share thoughts and observations, defend viewpoints, and negotiate consensus about their thinking to make their entries.
- **Electronic** because the entries are produced and recorded on computers in the form of a chronologically organized word-processing document.

My interest in using students' writing to gain access to their thinking was developed while working with a group of science teachers, over a two-year period, in an NSF-funded project at the University of Massachusetts, Lowell. We worked to develop new ways to determine what our students had learned and understood about the science they studied. The process of trying alternative assessments over time, reflecting on the results, and sharing our insights with colleagues through our own writing was a powerful professional development experience.

A NEW KIND OF JOURNAL MEETS NEW NEEDS

I started to use ICE learning logs with my advanced physics class in 1993. The idea for learning logs had grown gradually over several years, and the technique was developed to meet several different needs:

- I had asked my students to keep journals several times, but I could never keep up with them. Like most busy teachers, I was always overwhelmed with the task of reading and responding to their entries.
- I also felt strongly that my students needed to collaborate, not compete, in my classroom. I wanted them to share their ideas as they constructed their understanding of the science we were investigating.
- The Physics II class was a unique alternative to an AP course. We were exploring four topics—fractals, particle physics, cosmology, and relativity—in depth, using new materials, some still under development.
- I needed to integrate into my day-to-day instruction the use of eight high-end Macintosh computers, received as a result of a grant from the ACOT (Apple Classroom of Tomorrow) program.

The need for a sophisticated method of communication became apparent as my Physics II students worked through the fractal unit using the novel materials developed at Boston University's Center for Polymer Studies. Student groups performed experiments, manipulated computer simulations, and generally tried to make sense of this new science.

The model of teaching I eventually employed in this class was that of Cognitive Apprenticeship (Collins, 1991). The students investigated a conceptually rich topic and gradually learned new skills, which they applied in more diverse and complicated situations. At the end of the unit, student research groups submitted proposals, conducted research, and presented their findings at a research conference. The audience included their peers, research scientists, educational researchers, the school principal, and other classroom teachers. Finally, each group published their research reports in Proceedings from the conference and in The National Student Research Center's web-based E-Journal of Student Research.

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ICE learning logs helped hold together this complicated educational experiment. They served to build group identities, to help me monitor student progress, and to provide a mechanism for feedback and encouragement. But, since the students were writing group journals, the time required for me to read and respond to their entries was kept to a manageable level.

How to Use ICE Learning Logs

ICE learning logs are simply a running word-processing document. Each day the groups open the document, date their entries, and respond to my prompts. Although at first I did not realize that writing in collaborative groups would actually improve the quality of the students' understanding, the use of this technique solved some management issues and started to make groups comfortable using powerful computers to aid and document their learning.

Since research supports mixed-gender groups of three for problem-solving activities, I divided students into sense-making groups of three that were randomly assigned except that I made sure that there were no single-sex groups. Both in my initial entries and verbally I stressed that students were to work collaboratively and that each person in the group was responsible for contributing and learning all the skills needed to complete each day's task. To make the logs easier to follow, each entry was dated, and I always wrote my responses in a bold font; students were asked to use other fonts. (See Sample 1.)

My comments to each group were personalized and I tried to combine feedback, praise, and some humor. After a few weeks, the logs started to change dramatically, becoming complicated documents with more detailed entries, as we worked together to understand science.

Thus, the ICE learning logs, which began as a simple chronological record of classroom events, slowly evolved to include questions and concerns, charts and graphs, images and diagrams, and a rich source of data to inform my instruction. Learning logs were valuable to each group member since there was always a lively discussion within the group as students made sense of their observations and constructed written responses for their log entries.

Also valuable was a record of the development of students' thinking as they constructed meaning of a concept throughout the unit. For most of the class, this was the first time they had ever thought about how they came to understand an idea.

Since the computers were networked, I could sit down before or after school and respond to their log entries. I found it was crucial to respond to the logs every day since ideas often age quickly. Plus, students were really interested in what I had to say to them.

Using ICE Logs as Portfolios

Since the ICE learning logs are really portfolios of student work, I always tried to provide opportunities for student groups to evaluate their own work and compare it to that of their peers. Some students claimed that this was the first time that they had had the opportunity to judge their own work in relation to that of their classmates.

Some of the specific tasks that students completed in their logs were:

- Summarized articles or textbook chapters or developed explanations for their observations.
- Agreed on their observations and proposed explanations for their results.
- Tested the validity of models they developed in new situations.

Sample 1

(This is a first entry in the Interactive-Collaborative-Electronic Learning Logs in the Physics II class.)

9/10
Welcome to the electronic world of scientific sense-making!

I am Mr. Hickman and I will try, through this electronic medium, to be your teacher, guide, mentor, advocate, encourager, and listener. I will always use a bold font to respond to your entries. You may use any other readable font that you wish when you write in your logs but please write at least one entry each day and make sure that you date each entry.

Feel free to express your questions, concerns, suggestions, and any other issues that you would like to have addressed. This log is semi-private between your group and me, your coach, though there will be times when we share log entries with the other groups. I will try to do my best to respond to your log entries every day. Today will be the last chance for you to respond as individuals. After you have completed your introductions, all of the rest of your responses will be for your group.

Let's start! Please introduce yourself and then select a group name. We have talked a little about learning and this fractal stuff. We made some measurements by hand and on the computer, learned or revisited the technique of concept mapping, and even read an article. How do you like what we have been doing so far?

- Used simulations to model the behavior of an actual object and to understand that these simulations are approximations for real behaviors.
- Represented their understanding in words, tables, and diagrams.
- Generated questions based on the group's ideas. Many of these questions became the basis for either group or class investigations.
- Reflected on what they had learned and how their experiences brought them to their current understandings.

In general, the students who used ICE learning logs learned the physics content at a deeper level and took much more responsibility for that learning. For me as their teacher, I gained an insight into their personalities and thinking that was not possible without our interactive conversations.

OTHER GROUPS RESPOND TO ICE LEARNING LOGS

Since my initial implementation of ICE learning logs in 1993, I have used them not only with second year physics students but also with ninth grade physics students for a two-week magnetism unit. While the students were more playful in their entries, it worked there too! (See Sample 2.)

Sample 2

(This sample is an ICE log from a ninth grade group partway through the unit. They are working to develop a model for magnetic behavior.)

4/8
Good morning!
How did you like our spring snow? Don't forget to describe what you needed to change to improve your model. How would your model explain two nails—one rubbed a little and one rubbed a lot?
Mr H

4/8
If the nail was rubbed a little, like once, then some of the arrows will point in a north/south direction, but some of them will remain in unorderly directions. If the nail was rubbed a lot, then it is most likely that all of the arrows will point in a north/south direction.

Today you need to make a list of at least three similarities and three differences between electrical and magnetic effects.
Thanks
Mr H

SIMILARITIES
1. Both have attraction and repulsion.
2. Both have particles that act a certain way when rubbed.
3. Magnetism and static electricity can last long on other objects, but they are not permanent.

DIFFERENCES
1. One has positive and negative charges, while the other is based on the north and south poles.
2. Magnetic effects only are present in certain metals.
3. When static electricity is transferred to an object, then it is charged. If the object gets aligned from a magnet, it is magnetized.

4/9
Good morning!
Thank you for answering my question and for your great list. I am not sure what you mean by #3 in your similarities. Could you please rephrase it?
Mr H

4/9
QUESTIONS
1. How can Earth, or any of the other planets, be a magnet?
2. Does the Earth have a tail on one side of its magnetic field, or is it normal?
3. Does the moon have a magnetic field?
4. How exactly does an aurora work?

4/10
SNOW DAY!

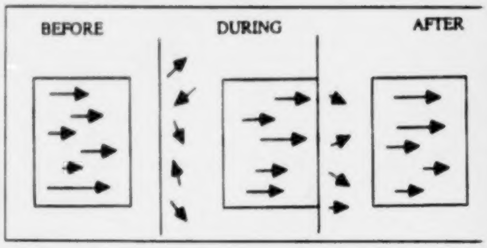
4/11
Good morning!
You have some great questions and we will do our best to answer them all!

Another spring snow! This one was a little more interesting. Plenty of heavy wet snow and a lightning stroke hit a tree on our property and the whole house shook from the thunder. The limb fell across the driveway.

It was a good thing they closed the school since the roads were horrible. So, how was your day off?
Mr H

4/11
Yesterday, K. just slept, A. worked on repairing his bicycle, and O. watched a lot of movies. K. accidentally came to school at seven, but since no one was there, and her dad came in to tell her after hearing it on the radio after dropping her off, she figured out that there was no school.

Here is our answer to the class question: The Betsy effect is almost like the nail crossed with the floating magnet on the coffee cup lid in the water. The nail would align itself with the magnet, just like some of the coat hangers. The "magnet" that would get the coat hanger to move is the invisible magnetic field. The reason why some of them didn't work was because they might have had the plastic covering on them.



4/12
Boy you have done some great work so far. Please label the two explanations. Thanks
Have a great vacation but remember that we will have a test on this stuff on Tuesday after we return!
Mr H

4/12
Here is our answer to the class question: Before the magnet comes in contact with the "refrigerator door", the little magnets in the door are pointing in every which way. When the magnet comes in contact with the door, then the opposite ends will attract each other, but the magnets will not point completely parallel, because the magnet did not rub on the door, which will get it to go parallel. That is why afterwards, there is no evidence that the magnet was even there, because after the magnet is removed, the particles will go back, because nothing is attracting them anymore.

Have a nice vacation!

At the end of the unit on magnetism, I asked the ninth graders how this unit differed from others in our course. These are responses from two student groups.

> "This unit is different to other ones we've done this year because we spend more time developing the ideas on our own as opposed to just memorizing someone else's ideas that are fed to us. There's a lot more interaction with our classmates in this type of unit where we are collaborating on ideas. We find this more helpful because we are exposed to other people's ideas, not just our own. We agree that we all enjoy this learning style more than the traditional classroom style."

> "We think this unit is different than the previous units we have done because we are learning on our own rather than just taking what you tell us to be fact. We get to try things first hand, too. We also find the time goes by much faster doing things on our own. Even though we like this, it's also more difficult than learning with you telling us what is right. We usually have to find out that we are wrong before we can find out that we are right."

I also used ICE learning logs with science teachers from around the country who met at Boston University for three NSF Patterns in Nature summer institutes (1994 to 1996). The purpose of these institutes was to introduce these teachers to the experiments, tools, and software developed to help students explore the world of fractals. They were also designed to model an instructional method that they could use back in their classrooms to implement the materials with their students. At the end of the institute, I asked about their experience with the logs. A typical response follows:

> "I had never really thought of using the computer for logs before. After the institute, I am convinced of their use as a learning tool for both the kids and the teacher. Students don't often discuss what is going on in class because time is a very limited resource. These logs seemed to make students talk about events that have transpired and reflect upon them. You are right, teachers often get much needed feedback too late to make a big difference."

Many of the teachers who participated in the institute are still using ICE learning logs today.

Most recently, I used the technique for two consecutive years with both ninth grade and junior/senior physics students for a six-week pilot unit for the NSF-funded project, Constructing Physics Understanding in a Computer-Supported Learning Environment (CPU). Here we used an interesting class structure where students worked in pairs to carry out the activities and then met in triads, each member from a different lab group, to use the ICE learning logs and make sense of their observations. I structured the class this way since I had found, over the years, that students do not always observe the same things while performing their laboratory work. When the triads met at the computers, the first thing they did was to agree on their lab observations. The simple equipment they had used in the lab was available to them, so they could repeat part of the experiment if they did not reach consensus. ●

Editor's note: Teachers reading this article will no doubt develop their own unique ways to use ICE learning logs with their students. Please let us know how they work for you. See page 15 for information on how to share your ideas with Focus *readers.*

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USING SELF EVALUATION WITH FOURTH GRADERS

Elementary school is not too early to help students learn to assess their own achievement. The benefits include better communication with parents and increased student confidence.

by Leah Poynter, ENC Publishing

In her work as a fourth grade teacher at Bridge Street School in Northampton, Massachusetts, Margaret Riddle has learned that self evaluation can be a valuable part of her assessment of students. A week or two before report cards come out, Riddle works with her students to fill out self-evaluation forms (see example on pages 29 and 30.).

Riddle developed the forms using the categories that are on the report card, but she rewrote them in more "kid-friendly" language and helped students understand unfamiliar terms. To gauge their success, students color in bars as far as they think they are achieving, ranging from "never" and moving through "sometimes," "often," and "all the time."

"When they look at the self-evaluation, it looks like a graph. At a glance, they can see their strengths and weaknesses," says Riddle. Students also answer two reflection questions: "Three things that I achieved this semester" and "Two things I need to work on."

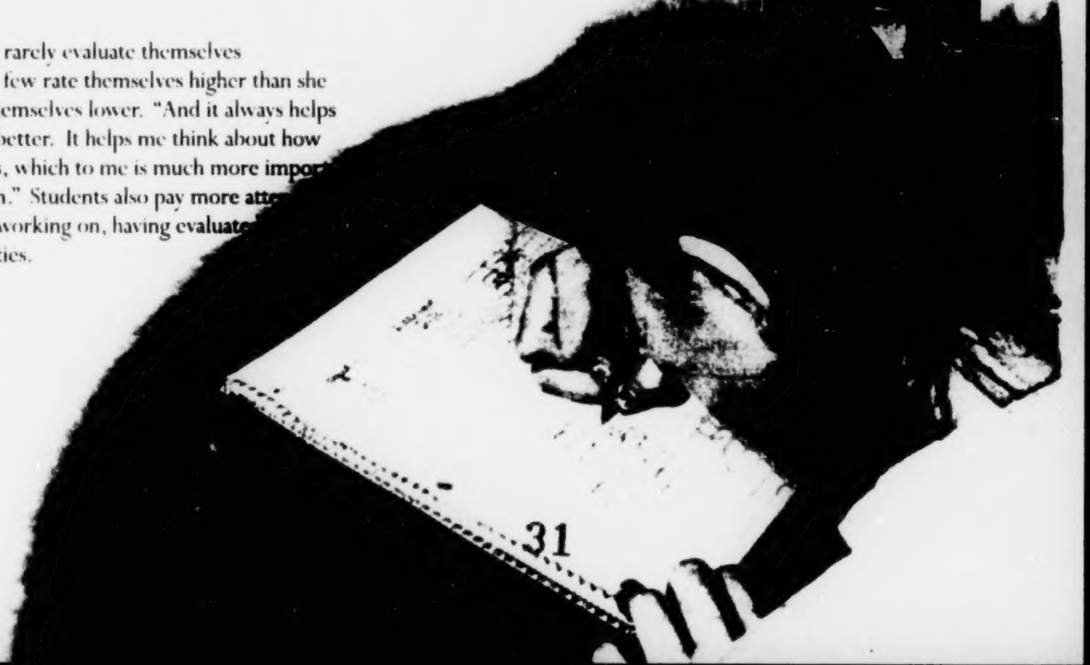
Students take the self-evaluation forms home and go over them with their parents, who are asked to write comments and send them back to school. One outcome from this strategy is that parents and students both gain a better understanding of the report card categories.

Riddle says that students rarely evaluate themselves inappropriately. While a few rate themselves higher than she would, many kids rate themselves lower. "And it always helps me to understand them better. It helps me think about how they perceive themselves, which to me is much more impor
than how I perceive them." Students also pay more att
to what they need to be working on, having evaluate
themselves on their abilities.

Riddle believes that if children really have learned to assess what they do understand, they may have the confidence to use their skills to figure out something they haven't seen before. The first time Riddle's fourth grade class was required to take a state proficiency test in mathematics, she notes, "They were confronted with all kinds of material they had never studied before, but that didn't stop them! They just had the attitude, 'I can figure this out.'" Her students' test scores were not particularly noteworthy, but it was their "can do" attitude that pleased their teacher most.

An earlier article about Margaret Riddle, "Teacher Advice on Connecting Home and School," was published in the Innovative Curriculum Materials issue of *ENC Focus: A Magazine for Classroom Innovators* (Vol. 6, No. 1, 1999). See it online at enc.org/focus/innovative/

Editor's Note: Fourth grade teacher Margaret Riddle created the student form on pages 29 and 30 by simplifying the language on her district's report card. Feel free to reproduce it for your own use.



Self Evaluation Graphing Sheet

Name: ______________________________

Directions: Color the bar next to each category out as far as you think you are achieving at this time.

	NEVER	SOMETIMES	USUALLY	ALWAYS
Learning Skills / Work Habits				
Listen attentively				
Follow directions on my own				
Follow routine				
Work independently				
Stay on task				
Participate cooperatively				
Participate in discussions				
Accept suggestions from others				
Behave respectfully				
Follow rules				
Accept consequences				
Make transitions				
Literacy: Reading and Writing				
Read for meaning				
Use various strategies				
Read independently (SSR / at home)				
Write to convey meaning				
Write creatively				
Use proper mechanics				
Learn assigned spelling words				
Use resources to correct spelling				
Show effort				
Go beyond expectations				
Mathematics				
Understand concepts				
Use various strategies to solve problems				
Communicate ideas				
Know basic number facts				
Work accurately				
Show effort				
Go beyond expectations				
Science and Health				
Understand concepts				
Pursue independent research				
Show effort				
Go beyond expectations				
Social Studies				
Understand concepts				
Pursue independent research				
Show effort				
Go beyond expectations				

Form published in Poynter, L. (2000). Using Self Evaluation with Fourth Graders. *ENC Focus: A Magazine for Classroom Innovators* 7(2) 28-30.

Self Evaluation Summary

Name: ______________________________

Three things that I achieved this semester:

____
____
____
____
____
____
____

Two things I need to work on:

____
____
____
____
____

My signature Date

____

Comments from family member

____
____
____
____
____
____
____

Family member's signature Date

____

Form published in Poynter, L. (2000). Using Self Evaluation with Fourth Graders. *ENC Focus: A Magazine for Classroom Innovators* 7(2) 28-30.

ASSESSING STUDENT LEARNING—AND MY TEACHING—THROUGH STUDENT JOURNALS

This physics teacher finds the challenges of using student journals as an embedded assessment strategy are amply repaid by the benefits to both students and teacher.

by Bill Hemmuller, Science Teacher, Westerville, Ohio

Like many educators, I have tried a variety of methods in an attempt to more fully engage my students in the learning process. In my high school physics classes, I have had some measure of success through the use of inquiry-based laboratory activities, the infusion of technology into the learning process (computer and calculator-based labs, Internet use), cooperative learning strategies, and many other techniques.

However, I have always believed that I could be even more effective as a science teacher if I had a better understanding of what my students were thinking. I wanted to know students' perceptions—not only of the scientific concepts, but also of how I was teaching those concepts.

I have made great strides towards this goal through the use of student journals. Making a commitment to the journaling process has led to new challenges, it is true, but also new benefits.

THE CHALLENGES:

Stimulating Students to Think on Paper

To get students started, I provide journal prompts on a weekly basis. In choosing the prompts, I try to offer a mixture of strategies. Some prompts are very specific to the content of physics:

- How can the coefficient of friction be determined by knowing only the angle of an inclined plane?
- Discuss the similarities and differences between gravitational, electric, and magnetic fields.
- Describe the concepts of sound as they relate to your favorite music.

Other prompts bring student attention to the process of learning physics:

- What are your goals and expectations for this course?
- What is your preferred learning style? What are the implications for this class?
- Reflect back upon your original goals and look ahead to what you would like to accomplish before the year is over.
- How has physics changed your world view?

The prompts illustrate my belief that, while physics is very important, it is more important that students develop an ability to think and develop strategies for learning, regardless of the content of a specific course. Any content area can be explored in student journals. To create good prompts, teachers simply need to choose questions that require students to generalize, draw comparisons, extend concepts, or explain an idea.

Finding Time to Respond

Although the careful selection of prompts is quite important, I have found that my response to each student is even more critical. I take pride in the fact that I respond individually to each journal entry made by my students. My feeling is that if it is important enough for them to write about, it merits a response.

Through this process, I am able to establish a personal dialog with each student. This relationship motivates students to take the journals seriously.

I must admit that this practice is quite time-consuming. To justify the investment, the journals must offer many rewards for the educational process. I have found that the benefits of the dialog more than justify the investment of time, for teacher and students alike.

THE BENEFITS:

Gaining Insight into Student Thinking

The use of journals makes me aware of students' experiences and previously held misconceptions so that I can adapt instruction to best meet their needs. Early in the year, I use journals to find out as much about my students as possible. As the year progresses, I use journals at the beginning of each unit of study to find out what students know about a topic before I present any lessons.

Many times, students possess some very strongly held misconceptions about the physical world. These ideas can only be confronted if the teacher is aware of them. I have found that journaling is a very effective method for addressing this issue.

For example, Joel (all student names have been changed) discusses how he would explain a friction and center of mass demonstration that causes one's hands to meet in the middle when they are slid along the bottom of a meter stick from opposite ends:

> "Once again, physics baffles me. When I got home, I used one of my own meter sticks just to make sure you weren't using trick meter sticks. It obviously has something to do with friction, but with the friction we just learned, friction was related to acceleration and velocity. In this demo, friction doesn't seem to be related to either of these...."

This journal entry was very revealing to me. Even though it is not my intention, students are making generalizations about concepts based on the examples I use. Joel is making assumptions about friction, acceleration, and velocity based on his own limited experiences. This indicates to me that I must provide other learning opportunities that will allow Joel to generalize the concept beyond his understanding of a few specific examples.

Challenging Students to Construct Concepts

The use of journals challenges students to construct concepts as they are developed in class. By carefully choosing the prompts to which they respond, I challenge students to come to grips with what they know and how they understand it. Students are required to grapple with the many ideas floating around in their heads.

In this process, students are practicing self-assessment as they evaluate their own understanding of the physical world. This is depicted in the following entry written by Sandra regarding the motion of projectiles:

> "...I know that they both should hit the ground at the same time but I can't understand why they do. The one is falling straight down and is accelerated by gravity and the other one is-
> WAIT A MINUTE —I GET IT! THEY ARE BOTH BEING PULLED BY GRAVITY! THERE IS NO ACCELERATION HORIZONTALLY!
> Now I understand! I guess it's not that difficult after all..."

When discussing the concept of relativistic time, Natalie wrote:

> "I have to say that I've become confused and at the same time intrigued and completely fascinated by this concept of time....I had never thought of time as a fourth dimension but rather as a constant..."

Both of these entries exemplify the process of concept development by students. The key point is that the construction of knowledge is a process, and journals are an excellent medium through which this process can play out.

Opening Lines of Communication

The use of journals opens the lines of communication between my students and me. This allows me to address their concerns as they arise and to receive continuous feedback from the people whose opinions matter most. For example, Kevin wrote:

> "...I don't feel like I can do the problems, and I haven't felt like that for a long time....I'm not saying I don't think we should be challenged, but I think we should be given problems that at least give some hint as to what steps we should take in order to solve them. They just don't make sense!"

After reading this entry, I knew that something was missing from my instruction. Since Kevin was one of the very best problem solvers in the class, I knew he must be speaking for many students. I spent a day helping students solve the problems, being careful not to solve the problems for them. Here is what Kevin wrote after that:

> "I did this reflection yesterday [the one listed above] and today I was able to do the problems...Maybe that's why the problems are a challenge, they make you think. Anyway, I'm not angry anymore."

This example illustrates the importance of using journals as a forum to achieve an open line of communication. Rather than shutting down in his discouragement, Kevin was able to voice his concerns and ultimately realized the importance of problems that "make you think."

AN ONGOING PROCESS

Through my experiences with journals, I have grown as an educator in ways that I never dreamed were possible. This form of student feedback has had a tremendous effect on what I teach and how I teach it. I feel I have an understanding of where my students are, where they would like to be, and how they plan to get there. With my comments, I am able to share with them my input in these areas as well.

Journals have enabled me to make assessment in my classroom an ongoing process where open dialog is encouraged, continuous feedback is expected, and individual ideas are valued and given an environment in which to grow. While I know I need to continue to improve my ability to provide genuine, authentic assessment opportunities for my students, I am on an enlightening journey and I am truly enjoying the ride! ◉

Bill Heinmiller teaches general science and physics at Westerville South High School in Westerville, Ohio. His previous article, "Roll with It: An Activity Integrating Mathematics and Science" was published in the Inquiry & Problem Solving issue of ENC Focus. *It is available online at* enc.org/focus/inquiry

Journals Foster Honest Communication

The following communication with "Tim" illustrates the importance of teacher-student communication that can occur within the journal.

Early in the school year as students are familiarizing themselves with the class, I give them opportunities to write about their thoughts regarding the course. Tim wrote:

> **To be honest with you, I have no idea what to write...I think the last two labs were pointless (not to sound rude or anything).....I wasn't really sure what to expect but this isn't it. I'm sorry if I came off the wrong way....please don't take this personally or anything like that. I'm a bit confused at the moment. I like your class and I like the way that you teach, but I just thought it would be different.**

As you can imagine, this is not an easy message for a teacher to read. My first feeling was, "How can he possibly know what's best for him? I'm the teacher here!" However, I gathered thoughts, and then responded. This is a very important benefit of journals. They allow me to gather my thoughts rather than responding based on my first reaction. Here's part of what I wrote:

> **That's what I want to know. I'm glad you're honest. Stay that way! That's why I want you to write in your journal so I can find out what you're thinking...I guess I can't blame you for being a little confused right now—things are probably different from what you expected and from other classes you have had. I guess I'll have to ask you to trust me.....I really think you can do well, and I think it will be a class you can enjoy too. Thanks for letting me know what you think—I value your opinion.**

The following week, at the end of another, content-related journal Tim wrote:

> ...I also would like to thank you for offering to help me, and I appreciate it a lot. I think I'm getting the hang of this lab and journal writing. But any tips or hints you can give me, I would greatly appreciate it Mr. H.

As I look back on this dialog and the continued conversation that followed, I appreciate the journals even more. This is one example of how a student who was struggling with the direction and content of the course was able to communicate his concerns to me. Not only was I able to address many of his concerns, but I was also able to open a line of communication that enriched our daily, face-to-face interaction. I'm not sure that verbal interaction on a daily basis would have ever yielded such discussions without the journal.

DETERMINING WHAT IS TO BE TAUGHT:
The Role of Assessment

The Educational Testing Service (ETS) has developed a clear viewpoint on the relationship between curriculum and standardized testing.

by Nancy S. Cole, President, Educational Testing Service

The determination of what should be taught is a social and political enterprise. In the middle of this milieu are tests that often carry inordinate weight in defining what should be taught but that may escape the full scrutiny of the social-political process because of their presumed scientific neutrality or unassailable objectivity.

Testing cannot be neutral on what is taught and learned. Any test is an expression of values on teaching and learning. I believe the same social and political processes used to set curriculum directions must be applied to testing. In fact, large numbers of educators set specifications, write questions, and review most tests in wide use. However, without a clear understanding of how to align tests with teaching, such processes are hollow. One of the failings of the reform era is our limited progress in understanding this alignment.

Once we understand the alignment, we will still face the question of whether to align national tests with the most widely used teaching practices or the most forward-looking ones. To stay too close to current practice is to fail to support improvement; to be too far in front is to be unfair to the mass of teachers and students.

Our best hope is to view testing as a critical and integrated part of the teaching-learning process, subject to the same public review and scrutiny in setting what should be tested as in determining what should be taught and learned.

Nancy S. Cole is president of Educational Testing Service and a researcher and writer on issues of testing policy and test fairness. She is a past president of the American Educational Research Association and the National Council on Measurement in Education and a former member of the Mathematical Sciences Education Board of the National Research Council.

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STATEWIDE PORTFOLIO ASSESSMENT IN MATHEMATICS:
A Teacher's Perspective

A teacher who was involved in Vermont's statewide portfolio assessment system tells how and why it works.

by S. Leigh Nataro

At certain times of the year — usually in the fall or spring — the supply of number 2 pencils in many schools dwindles. Students are told "make your marks dark" and "fill in each oval completely." Although some may question the value of any test that requires oval filling, most educators agree that machine-scored assessments can be useful for measuring students' basic mathematics skills and comprehension.

However, how can mathematics problem solving and communication be assessed? If students are to demonstrate their ability to communicate about mathematics, shouldn't they be allowed to decide what vocabulary to use, what notation works best, and what representation can be used to support a concept? Can this ability to communicate about mathematics be assessed in a two-hour multiple-choice test?

To be assessed in the area of problem solving, students must be presented with genuine problems that can be solved in a variety of ways. In a true problem, the solution should not be immediately obvious to the student. Is it reasonable to put strict time limits on problems that we want students to struggle with and solve by multiple methods?

Some assessment publishers are currently designing standardized tests specifically focusing on problem solving. Until someone successfully develops such a test, one of the best ways to assess mathematical problem solving and communication is through the use of portfolios.

In 1992, Vermont teachers along with the Vermont Department of Education and the Vermont Institute of Science, Math and Technology began to develop Portfolio Scoring Guides for use at the elementary, middle, and high school levels. During the development of the scoring guides, alignment was checked with the National Council of Teachers of Mathematics (NCTM) Standards and state standards.

In addition, a selection of portfolio tasks along with benchmark pieces of student work was compiled to allow both teachers and students to understand the various levels for each criterion on the scoring guide. (See the problem-solving and communication criteria on pages 36 and 37. A sample of a student task that serves as an eighth grade benchmark is reproduced on page 38 with scoring of the benchmark on page 39.) As the result of the work of more than 100 educators, Vermont developed a successful statewide portfolio assessment system.

COMPILING STUDENT PORTFOLIOS

At the end of fourth, eighth, and tenth grades, students compile a portfolio of their seven best portfolio pieces. These seven best pieces can include work from the previous academic year. In addition, the seven pieces must address at least three of the four content strands: number sense and numeration, geometry and measurement, statistics and probability, and patterns, functions and algebra.

Although the collection and scoring of portfolios may seem like a one-shot assessment, portfolios are developed over the course of two years so students have many pieces from which to choose. Of the seven pieces selected for the portfolio, two can be done as group work and are designated as such. In addition, students have opportunities to solve problems and receive feedback about practice tasks that are not included in their portfolios.

Editor's note: The accompanying materials from the Vermont Elementary and Middle Level Mathematics Portfolio Scoring Guide are reproduced with permission of the Vermont Department of Education.

JUMP ONLINE!
The online version of this article includes additional student benchmark pieces from the Vermont Portfolio Scoring Guide. Visit: enc.org/focus/assessment

THE PORTFOLIO SCORING SYSTEM

Portfolios are assessed at both the local and state levels. To become eligible to score portfolios at either level, teachers must go through a calibration process. During a one-hour session, teachers score two sample portfolios. Each teacher's scores are compared with scores that have been agreed upon by teachers on the state benchmarking committee.

After teachers receive their calibration scores, they review the scores and the rationale for each score. Teachers who achieve a high agreement between their scores and those of the benchmarking committee may apply to score portfolios at the state level.

Problem Solving Criteria

Approach and Reasoning

START HERE

Level 1	Level 2	Level 3	Level 4
• Approach wouldn't work **or** • No approach evident	• Approach would[1] lead to solving only part of the problem[2] or reaching a partial solution **or** • Approach would work but there is some flaw in the reasoning	• Approach worked or would[1] work for solving the problem, and reasoning, if evident, is not flawed (Note: Use of a formula is an approach that worked or would work)	Approach worked, and at least one of the following three additional aspects of good problem solving is evident. • **Justifying the application of a known formula or rule** *used* to solve all or part of the problem **or** • **Making a formula or rule** *used* to solve all or part of the problem **or** • **Describing verification** of her/his solution[3]

Connections

Level 1	Level 2	Level 3	Level 4
• Response stopped without including a mathematically relevant observation with respect to her/his solution	• Made a mathematically relevant **observation** about her/his solution **or** • Identified an **underlying** mathematical **concept or pattern** in her/his solution **or** • Solved the problem *and then* **recreated**[4] the problem and found a new solution **or** • Solved the problem *and then* used **a different** mathematical **process** to solve the same problem	• Related this problem to a similar problem *or* to a real world phenomenon **by expressing the mathematical relationship(s)** **or** • **Analyzed the relationship** among elements in her/his solution *or* among similar or different mathematical topics in her/his solution **or** • **Tested** and accepted and/or rejected an **hypothesis or conjecture** about her/his solution **or** • Identified a formula or rule, while solving the problem, that worked or would work in solving all or part of **that** problem.	• Solved the problem, discovered a general rule[5] about the solution[3], and **demonstrated understanding of the generalization** either through explanation of the derivation, or through application to more than one other case **or** • Solved the problem, *and then* **extended** her/his solution to a more **complicated situation** **or** • **Evaluated** the **reasonableness** or **significance** of her/his solution

Solution

START HERE

Level 1	Level 2	Level 3
• No work is present **or** • No part of the solution[3] is correct **or** • Some work is present, but the work doesn't support the answer given	• The solution[3] is correct for only part of the problem and there is work to support those correct part(s) **or** • The solution[3] contains mathematical errors which lead to an incomplete or incorrect answer	• The answer is correct, *and* the work in the solution[3] supports the answer

[1] **Would:** An approach that would work for solving the problem addresses all aspects of the mathematical situation presented in the task. An approach that would work may contain mathematical errors, an incorrect solution, or may be incomplete

[2] **Part of the Problem:** Within a problem, there may be several *mathematical* components that need to be addressed, or there may be multi-parts. If not all of the mathematical components of the problem are addressed, or not all of the parts of the problem are addressed, then the student only found an approach to solve part of the problem

[3] **Solution:** All of the work that was done to solve the problem, including the answer.

[4] **Recreated:** The student substituted different numbers in the same problem and found another solution, or used the same procedure in a different circumstance.

[5] **General Rule:** A rule that can be used no matter what the numbers in the problem are, either expressed in algebraic notation or in words

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At the local level, portfolios are scored annually. Most commonly all portfolios are scored once, with 20 percent being scored again by a second teacher to serve as a check for score reliability.

At the state level, a stratified random sample of portfolios is collected every other year. These portfolios are scored during one week in the summer by approximately 60 teachers who have received additional training and whose scoring calibrates well with state standards.

Using a random sample on the state level shifts emphasis away from the scores of individual students or schools. Instead, the sample of portfolios shows how the state is doing as a whole in the areas of mathematical problem solving and communication.

Communication Criteria

Mathematical Language: Terms/vocabulary and symbolic notation

START HERE

Level 1	Level 2	Level 3
• Is absent or • Contains significant flaws in accuracy or • Is limited to the language of computation vocabulary and notation or • is limited to formulas that appear without explanation, derivation, or use	Is **relevant**, but may contain minor flaws **and** • Is the **sparse use** of the language of... • Number sense and numeration, number relationships, number systems and number theory (including fractions and decimals) or • Geometry and measurement[6], or • Statistics and probability, or • Patterns, functions, and algebra or • Demonstrates understanding of noncomputational language presented in the task (Note: Use of a single noncomputational term rarely merits a level 2)	Is relevant and contains no significant flaws and **demonstrates understanding through...** • **Consistent use** of non-computational language beyond that presented in the task, including the language of... • Number sense and numeration, number relationships, number systems and number theory (including fractions and decimals) or • Geometry and measurement[6] or • Statistics and probability, or • Patterns, function, and algebra OR • **Use of** algebraic or other notation(s)[7]

Mathematical Representation: Graphs, plots, charts, tables, models and diagrams

START HERE

Level 1	Level 2	Level 3
• **Didn't** attempt to make any mathematical representations to solve or communicate an aspect of her/his solution, regardless of the correctness of the solution or • Made only **inappropriate** mathematical representations to solve or communicate an aspect of her/his solution regardless of the correctness of the solution	• **Attempted** to make an appropriate mathematical representation to solve or communicate an aspect of her/his solution, regardless of the correctness of the solution, but the representation lacks labels and/or accuracy with regard to the student's solution. (Note: Completion of a teacher structured representation cannot earn above a level 2)	• Made an **appropriate** and **accurate**[8] mathematical representation to solve or communicate an aspect of her/his solution, regardless of the correctness of the solution. See glossary for requirements. (Note: The student's text may supply the necessary labeling).

Documentation

START HERE

Level 1	Level 2	Level 3
• The documentation of the student's correct or incorrect solution contains **little or no evidence** of how the problem was solved or the reasoning used	• The documentation of the student's correct or incorrect solution **contains some clear parts**, but there are gaps in how the student solved the problem or the reasoning used	•The documentation of the student's correct or incorrect solution **clearly shows how the problem was solved, and the reasoning used.** This may be evident by some of the following... • Results of any necessary computation are present • Answers are highlighted • Presentation is in logical order • Representations are linked to text • All parts are connected and labeled

[6] **Measurements:** Attributes of length, capacity, weight, mass, area, volume, time, temperature, and angle.

[7] **Notation:** Includes the use of algebraic equations and formulas (with all variables defined), and/or other notations (!, Σ and exponential notations).

[8] **Accurate:** Mathematical representations that are technically correct and executed properly, including labels.

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8TH GRADE STUDENT BENCHMARK

2^X

One student was boasting to another student that she could determine the ones digit in any problem where 2 was raised to any power. She claimed she could do this without a calculator.

Her friend was sure this was impossible, so she quizzed her. Here are the results:

2^{100} ....last digit = 6

2^{93} ....last digit = 2

2^{51} ....last digit = 8

- Explain how the first student is determining the last digit so easily.
- Could you use a system like this for powers of three or other numbers?

STUDENT'S SOLUTION:

2^X

Last week a new girl came to our Algebra class. My teacher told her that she could sit by me, so I could help her in case she got behind and didn't understand something.

Wow! She was really smart and helped me on my homework.

One day while we were doing work with exponents, she said "I bet you I can determine the ones digit in any problem where 2 is raised to any power."

"O.K." I said and wrote down 3 numbers which were 2^{100}, 2^{93}, and 2^{51}.

Here's what she wrote down:

2^{100}___last digit = 6
2^{93}___last digit = 2
2^{51}___last digit = 8

I then checked her answers using my calculator, and found out she was right but before I could ask her how she could do it the bell rang and she said "See if you can figure it out tonight"

When I got home I decided to look at powers of 2 and make a chart (Chart is attached.)

When my chart was done, I circled all the ones digits and noticed a pattern—the last digits were in blocks of four and the pattern they were in was 2, 4, 8, and 6.

Then I thought of dividing the powers by 4, to see if I could find anything. (Work is on chart)

After doing that I found that the remainders also went in a pattern of 1, 2, 3, and 0.

I then concluded that to find the ones digit in any problem, where 2 is raised to any power you divide the power by 4, and if the remainder is 1, the ones digit is 2; if the remainder is 2, the ones digit is 4; if the remainder is 3, the ones digit is 8; if the remainder is 0, the ones digit is 6.

When I had my answer for the power of 2, I then made a chart for the power of 3. (Chart is attached.)

student recreates problem here

I found that for 3 there was a pattern of 3, 9, 7, and 1, and it also appeared in blocks of 4. So I then tried to see if there would be a pattern when I divided the powers by 4.

student identifies a pattern

There was a pattern and with the remainder 1, the ones digit will be 3; with the remainder 2, the ones digit will be 9; with the remainder 3, the ones digit will be 7; with the remainder 0, the ones digit will be 1.

Just by doing these two numbers, I am able to conclude that this method will work for all numbers and their powers.

This is not accurate. This rule does not work for all bases.

The next day at school I told the new girl about how I solved the problem and about how it will work for all numbers and their powers because she didn't know about that

Chart of Powers of 2

In Exponential Form		= Answer
$4\overline{)1}$ 0R1	2^1	2
$4\overline{)2}$ 0R2	2^2	4
$4\overline{)3}$ 0R3	2^3	8
$4\overline{)4}$ 1R0	2^4	16
$4\overline{)5}$ 1R1	2^5	32
$4\overline{)6}$ 1R2	2^6	64
$4\overline{)7}$ 1R3	2^7	128
$4\overline{)8}$ 2R0	2^8	256
$4\overline{)9}$ 2R1	2^9	512
$4\overline{)10}$ 2R2	2^{10}	1024
$4\overline{)11}$ 2R3	2^{11}	2048
$4\overline{)12}$ 3R0	2^{12}	4096

Chart Of Powers of 3

In Exponential Form		= Answer
$4\overline{)1}$ 0R1	3	3
$4\overline{)2}$ 0R2	3^2	9
$4\overline{)3}$ 0R3	3^3	27
$4\overline{)4}$ 1R0	3^4	81
$4\overline{)5}$ 1R1	3^5	243
$4\overline{)6}$ 1R2	3^6	729
$4\overline{)7}$ 1R3	3^7	2187
$4\overline{)8}$ 2R0	3^8	6561
$4\overline{)9}$ 2R1	3^9	19683
$4\overline{)10}$ 2R2	3^{10}	59049
$4\overline{)11}$ 2R3	3^{11}	177147
$4\overline{)12}$ 3R0	3^{12}	531441

Scores and Justifications for Eighth Grade Student Benchmark

2^x

CONNECTIONS

Level 1 [✓ Level 2] Level 3 Level 4

Justification: The student noticed a pattern, as well as recreates the problem (see student's work page 38). This is not a level 3 response because the "thought of dividing the powers by 4..." is an attempt to find an approach, but is not the formulation of an hypothesis. The student's rule *is* the solution. The student didn't solve the problem *and then* identify the rule.

Approach and Reasoning

Level 1 Level 2 Level 3 [✓ Level 4]

Justification: The student scores a level 4 for Approach and Reasoning because s/he made a rule that is used to solve all of the problem.

Solution

Level 1 Level 2 [✓ Level 3]

Justification: The student does explain how the first student determined the solution so easily and shows how the system could work for 3. Note: The way the problem is written (Could you use... makes a response optional. The student's response is correct for the required parts of the problem.)

Mathematical Language

Level 1 Level 2 [✓ Level 3]

Justification: The student consistently uses exponential notation beyond that given in the task throughout her/his solution.

Mathematical Representation

Level 1 Level 2 [✓ Level 3]

Justification: The working table on the last page is adequately labeled, titled, and is appropriate to the solution. The division by 4 is the student's work for the two column table.

Documentation

Level 1 Level 2 [✓ Level 3]

Justification: It is clear what the student did and why. All parts are connected and labeled, are in a logical sequence, and there are no gaps.

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EVIDENCE OF SUCCESS

There are two ways to judge the success of an assessment system. One way is to look at the statistics gathered. The other is to observe changes in the classroom through anecdotal evidence.

Although the portfolio system has only been in place throughout the entire state of Vermont for a few years, there have been statistical increases in student achievement in both problem solving and communication. The number of students achieving the standard increased by at least 5 percent across most of the portfolio scoring guide criteria. A complete comparison of statistics for 1996 and 1998 can be seen at: www.state.vt.us/educ/mathrslts.html#Portfolio/

In addition, I observed anecdotal evidence in my classroom indicating that portfolio assessment does improve students' problem solving and communication skills. For example, on the first day of class, my eighth grade students made mind maps of mathematics. Students included problem solving and problem solving strategies in their maps. Before our use of portfolios, students never displayed this level of awareness.

Even more significantly, when students were given a problem-solving task, they persevered. When one strategy did not work, they knew they had others that they could try. Students in my classroom also realized that getting "the answer" was only a part of problem solving and that communication of their ideas was equally important. These are attitudes promoted in the portfolio program.

MAKING PORTFOLIO ASSESSMENT WORK

Educators in Vermont have worked diligently to make portfolio assessment work at both the state and local levels. Students have been successful because teachers join together to look at data across grade bands—K-4, 5-8 and 9-12. Teachers recognize that it is not just the fourth grade, eighth grade, or tenth grade teachers' responsibilities to instruct students in mathematical problem solving and communication. In addition, teachers are realizing that the best way to teach problem solving and communication is through integrating these processes into their current curricula.

Portfolio assessment also works because teachers participate in professional development sessions throughout the school year. A well-developed network of leaders helps teachers become proficient in the use of portfolios, the use of the scoring guide, and the entire portfolio assessment system. It is important to note that these network leaders are practicing classroom teachers who can relate to the struggles that come with making major changes in classroom practice.

CAN STATEWIDE PORTFOLIO ASSESSMENT WORK IN YOUR STATE?

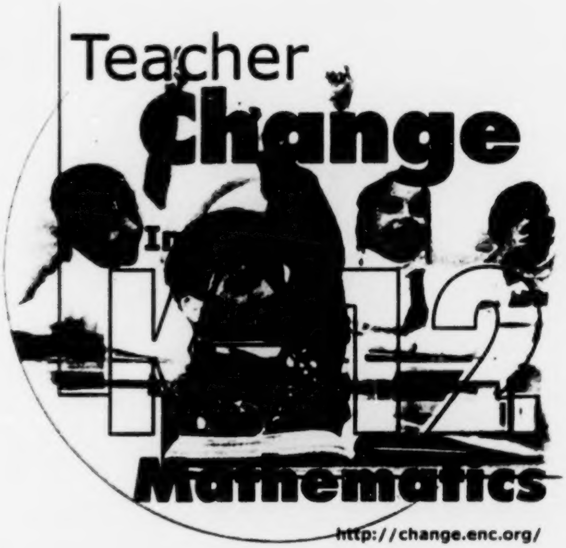
Some may point out that Vermont is a small state; its population of about 580,000 is the size of some larger school districts in the United States. However, I believe it is possible to have portfolio assessment work in other states as long as there is adequate support to promote systemic change. This support for change needs to come from everyone with a stake in our children's education: government officials, higher education leaders, K-12 teachers, administrators, and parents.

Leigh Nataro, a high school math teacher at Phillipsburg High School in Phillipsburg, New Jersey, has also taught in Iowa and Vermont. She scored portfolios at the local and state levels in 1998 and served as a member of Vermont's portfolio benchmark committee. Her other interests include creating assessment items for the ACT and serving as coordinator for the Math Forum Trig/Calculus Problem of the Week.

WHY YOU SHOULD CARE ABOUT TIMSS

What can an international assessment add to the huge quantity of data generated by state and national testing programs? Here are a few specific suggestions for learning from TIMSS.

by Tracy Crow, ENC Publishing


Teacher
Change
Improving
K-12
Mathematics
http://change.enc.org/

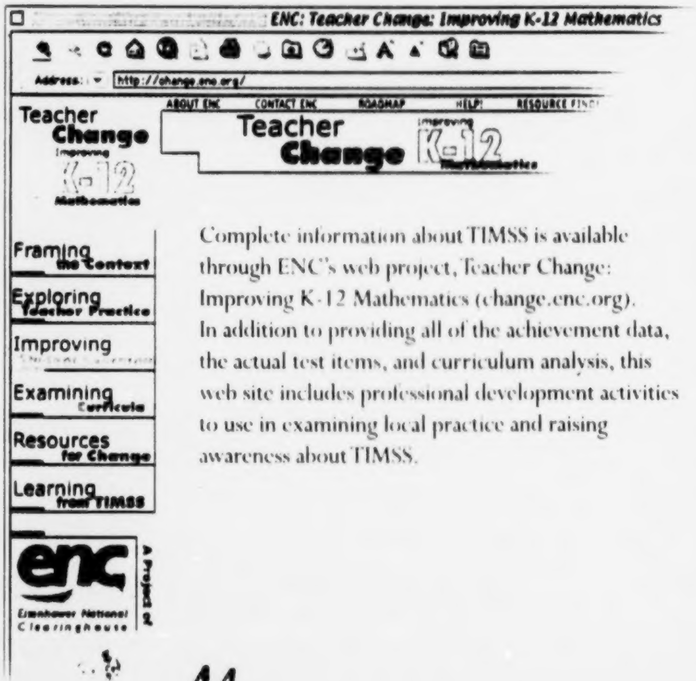
No overview of assessment in mathematics and science would be complete without at least a quick glance into the Third International Mathematics and Science Study (TIMSS). This study provides an overwhelming amount of data on teaching and learning in mathematics and science in more than 40 countries, including the United States. While the incredible wealth of data may hold the most interest for education researchers, other educators can use TIMSS results to look at U.S. education from a new perspective. Below are just a few ideas that may help teachers make connections between data from this international assessment and their own practice.

- Examine local coverage of specific subject areas in grades 4, 8, and 12 and compare what you do in your school with what is done nationally and internationally. The TIMSS data include information about what topics are taught at each grade level. Some countries cover several topics for several years, in a spiral fashion, while other countries cover a few topics at a time and then stop and go on to other topics. You can discuss what implications this has for instruction and achievement.

- Using the TIMSS test items, develop strategies for aligning instruction and assessment. The test items are a very accessible way to begin exploration of TIMSS, since educators are accustomed to looking at test questions and thinking about the understanding students must have to answer them. If teachers need to become more acutely aware of such issues, TIMSS is a great way to start a discussion about alignment of curriculum, instruction, and assessment.

- Develop an understanding of the TIMSS curriculum analysis to inform local curriculum decisions. Several frameworks for examining curriculum pieces are included in the TIMSS information.

- Discuss both teacher and student perspectives about a variety of mathematics and science education issues. The TIMSS achievement data incorporated surveys as well as other data collection methods. For example, students were asked how often they do an experiment or practical investigation in science class; teachers reported the amount of homework they assigned at different levels. The range of questions covered is wide enough to provide much food for thought. ◉


ENC: Teacher Change: Improving K-12 Mathematics
Address: http://change.enc.org/
ABOUT ENC
CONTACT ENC
ROADMAP
HELP!
RESOURCE FIND
Teacher Change Improving K-12 Mathematics
Teacher Change Improving K-12 Mathematics
Framing the Context
Exploring Teacher Practice
Improving
Examining Curricula
Resources for Change
Learning from TIMSS
enc
Eisenhower National Clearinghouse
A Project of

Complete information about TIMSS is available through ENC's web project, Teacher Change: Improving K-12 Mathematics (change.enc.org). In addition to providing all of the achievement data, the actual test items, and curriculum analysis, this web site includes professional development activities to use in examining local practice and raising awareness about TIMSS.

STUDENTS WILL RISE TO THE CHALLENGE

This state legislator has faith in the system—and students.

by EugeneWatts, State Senator, Ohio's 16th District

As the author of the law creating Ohio's proficiency testing ten years ago and as sponsor of a more recent law that raised the standards, I have fielded many questions and complaints from concerned citizens. I know the same debates are being held in many other states across the country.

Recently, I have been responding to questions about Ohio's new tenth-grade High School Graduation Qualifying Exam, which will be required for high-school graduation beginning in September 2004. In particular, the proposed math competencies have inspired the usual chorus of doom and gloom that seems to emerge every time we raise academic standards.

In dealing with the doubters, I feel confident that Ohio's proficiency testing program is being handled wisely and well and in a manner that can serve as a model for others. For example, Ohio's math competencies do reflect the concepts or skills that every high school graduate should know. In addition, the standards are designed to meet the most basic needs of all students, not just those who are college-bound.

These tests were developed by a cross section of the state's teachers and teaching experts from all fields of study, coordinated by the Ohio Department of Education, and all test questions are first field-tested in Ohio schools. Moreover, a bias review panel scrutinizes any test materials, looking for content or format that could adversely affect one group as compared with another. Specific math competencies that may have lacked clarity for students or did not meet widespread consensus after numerous public meetings and discussions were deleted.

It is a tribute to the process we have established that Ohio was one of only three states to receive a grade of A by the Fordham Foundation in its appraisal of math standards in 1998. Ohio's model math standards also have the highest rating by the American Federation of Teachers and a grade of B+ for the level of rigor in a review of state standards in 1998 by the Council of Basic Education.

Before proficiency testing, Ohio schools were graduating students with second grade math skills and fourth grade reading levels. Even today, Education at a Glance: OECO Indicators 1998 reveals that the lowest 25 percent of Japanese and Korean eighth graders outperform the average American eighth grader in math and science. And a recent report found that only 7 percent of Ohio high school seniors are prepared for learning and performing most skilled entry-level jobs.

But now we are moving in the right direction.

We are heartened by word from the field that the way the proficiency tests are drafted is encouraging students to be more thoughtful, since teachers are relying less on multiple-choice questions and requiring more open-ended and extended responses. Since the tests are conceptual in nature, students are not required to merely memorize and regurgitate, and schools have been motivated to revise their curricula in line with specific learning objectives that have increased performance in reading, writing, math, and science.

Moreover, testing exceptions are permitted. For example, students who qualify for special education classes and follow an individualized education program may have additional administration time or even be exempted.

In spite of these reasonable student accommodations and a nationally recognized curriculum, some critics believe that higher academic standards somehow punish students and produce some sort of academic meltdown. I do not believe that our children are intellectually inferior to those in other countries. Our students will rise to the challenge of high standards. They will succeed and be better prepared to compete in the new century. ◉

In addition to serving as an Ohio legislator, EugeneWatts is a history professor at The Ohio State University. Write to him at the following address: Statehouse, The Ohio Senate Building, Room 129, Columbus, OH 43215.

AUTHOR TAKES ON HIGH-STAKES TESTS

Alfie Kohn, an outspoken opponent of state-mandated, high-stakes proficiency tests, offers five reasons why such testing is detrimental to education.

by Julia Harris, ENC Publishing

At a recent appearance in Upper Arlington, Ohio, by author and former educator Alfie Kohn, the turnout of concerned parents, teachers, and administrators was so large—even with the ten-dollar-per-head entrance fee—that, at the last minute, the crowd had to be shuffled from the high school's little theater into their much larger auditorium. Kohn had been invited to speak by a grass-roots coalition of parents and community members, one of whom recounted with emotion how she had first become acquainted with Kohn's views on mandatory, high-stakes proficiency tests. And she was not the only spellbound listener as Kohn held forth on the various evils of proficiency tests, claiming that they "dumb down" education and contribute to the overall decline of the American public school system.

"Intellectual life is being squeezed out of classrooms in the name of higher standards," claims Kohn. "We are in the midst of a national education emergency."

Strong words, aren't they? And yet he seems to have touched a nerve. Everyone has opinions about proficiency tests, some more strongly held than others. Some educators lament that "teaching to the test" has forced them to limit their creativity in the classroom, thereby limiting their ability to teach effectively. To others, these high-stakes tests are simply one more hurdle to get over, a more rigid approach to the curriculum they already teach. Some advocates of these tests say that they help teachers organize and emphasize important content and hold students to higher academic standards.

Kohn would argue that he is not opposed to standards—as long as they are the "right" kind of standards. He suggests that there are two different types of standards, vertical and horizontal. Horizontal standards, he says, are basically guidelines to help teachers "shift their practice to help students learn better and differently." The National Council of Teachers of Mathematics published a set of standards in 1989 designed to help teachers help students become better problem solvers; the problem, Kohn says, is not with the standards but with the fact that, 10 years later, "math teaching remains stultifyingly traditional."

In contrast, the standards at play in high-stakes proficiency tests, according to Kohn, are vertical standards, which means that we basically require students to do the same thing they've always done, only they must do more of it harder and faster and better. What vertical standards do is merely intensify the status quo.

And for Kohn, the status quo is definitely not something he wants to see intensified.

Five Fatal Flaws

He points out five "fatal flaws" of this movement toward tougher standards and high-stakes assessment.

The first flaw he sees is that this movement has necessitated a rewards-and-punishment system that tends to undermine long-term quality. He likens it to a factory model of making change, where performance is mandated and coercion is applied through whatever means are available. "People don't resist change," Kohn suggests. "They resist being changed."

Kohn goes on to say that the tougher standards movement has gotten the idea of "improvement" completely wrong. "Harder is confused with better," he insists. The vertical standards at the foundation of the proficiency test model of assessment place undue emphasis on the level of difficulty. "Greater thoughtfulness is better than greater strain," says Kohn. "A more rigorous curriculum often turns out to mean a more onerous one." He points out that many states are introducing tests with questions too hard for most adults to answer, questions that don't address what we as a society tend to honor and value.

The third major problem with the current reform movement, according to Kohn, is that it relies on an ego-based motivation as opposed to task-based motivation. There is a vast difference between focusing on performance and focusing on learning. The latter approach is aimed at getting students to focus on what they're doing, while the former mainly makes them worry about how well they're doing it. Kohn stresses that a results-oriented kind of instruction—in which the outcome is a product of some sort rather than a process—encourages students to think that their success or failure is due to their intelligence (or lack thereof). "When you over-emphasize achievement, kids are thrown for a loop when they don't do well. They will pick easier tasks when given the chance."

A fourth flaw Kohn identifies is that the "back-to-basics people" do not have a correct understanding of how learning happens. "Kids aren't blank slates to be written on or pets to be trained," says Kohn. "They start out as active meaning-makers, struggling to make sense of things." The best classrooms, he suggests, are those in which kids struggle with controversial questions and learn to make better and more complex sense of the world in which they live. They learn the "basic skills" through interactive and active learning and by asking the kinds of questions kids normally ask.

Not only does the current reform movement get learning wrong, argues Kohn in describing his fifth flaw, it also gets assessment wrong. Timed tests, reliance upon multiple choice, frequent and time-consuming tests, and arbitrary ranking structures are just some of the many elements Kohn finds problematic about much of the current testing done in schools. He suggests that most tests in use today, such as the Iowa Test of Basic Skills, don't teach kids to be creative thinkers but to be better test-takers.

Educational Activism

So, Kohn asks his somber audience, what can we do about this? He offers several strategies for a benign sort of civil disobedience: talk to your neighbors, create networks of concerned community members, and garner support for opposition among teachers by passing out silent surveys within schools. He suggests that parents keep their kids at home on test day, citing one example of how 90 percent of Michigan students do not take the MEAP, the state's mandated proficiency test.

"Standardized testing is not a fact of life," Kohn concludes. "It's a political decision. Cry out for activism." ◉

Alfie Kohn's web site www.alfiekohn.com *presents his case against the "tougher standards," strategies for opposing the testing, and a list of state contacts.*

CRUNCH TIME

It's crunch time in many states that have enacted tough academic standards over the past few years. As pressure mounts on students and teachers to perform, some states are beginning to pull back, acknowledging that they have not provided the training or support structures necessary to meet the new standards.

Among the school systems taking a giant step backward are:

- Wisconsin, which gave in to parent demands that it withdraw a test required for high school graduation;
- Arizona, where the board of education agreed to reconsider a state math test passed by only 1 out of 10 sophomores last spring;
- Massachusetts, which set a low passing grade on its rigorous new tests required for graduation; and
- Los Angeles, where administrators said last week they intend to phase in a plan to end automatic promotion more gradually than originally intended.

Such "backpedaling" is "smart when you are heading over a cliff," said Jerome Murphy, dean of the Harvard Graduate School of Education. Many teachers say they are unprepared for and/or confused by the new standards. Students say they are being tested on material to which they have not been exposed. And some experts say states have confused minimal standards with lofty goals.

"Until you can walk into the average classroom in the average school and find the content being taught in a way that would help the average student meet the standard, it is not fair to penalize the students," said Richard Elmore, a professor at the Harvard School of Education.

This item is an NBS Brief based on the article "Academic Standards Eased as a Fear of Failure Spreads" by Jacques Steinberg, published in the December 3, 1999, issue of The New York Times on the Web. Visit: www.nytimes.com/library/national/120399states-expectations-edu.html

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STATE ACHIEVEMENT TESTS CAN BE A POSITIVE FORCE IN YOUR CLASSROOM

Instead of viewing state mandates as restricting her creative control of her classroom, this middle school teacher used the standards as a springboard to excellence and student involvement.

by Mary Ann Stine, Mathematics Specialist, State of Washington

The educational reform effort in Washington state became a reality for classroom teachers of fourth, seventh, and tenth grades with the initial administration of the Washington Assessment of Student Learning, a performance-based test in mathematics, listening, reading, and writing. As a result, teachers were obliged to examine their instruction and assessment practice — not the most comfortable or welcome situation.

As an active member of NCTM and the Washington State Mathematics Council, I had had more opportunities than many teachers to keep up-to-date in my profession. Over the years, I had participated in various workshops and inservices in an attempt to implement new instructional practices and engaging tasks in my seventh and eighth grade mathematics classes in Kennewick, Washington.

But, as the new state tests approached, I began to realize the importance of formal and informal assessment and how critical it was to embed these practices into my curriculum. I began to look for assessment tasks that would meet the Washington State Essential Academic Learning Requirements and that would also be engaging and mathematically rich for my students (see sidebar for an example).

Embedding Reform-Based Assessment in the Classroom

I knew that algebraic thinking needed to be developed at the middle school level. But, I also understood that traditional methods of manipulation of numbers and symbols were not always appropriate for young adolescents.

In response to that concern, my colleagues and I began to develop real-life, concrete lessons to teach algebraic concepts to our seventh and eighth grade students. By using our state's Essential Academic Learning Requirements to define what the students need to know and be able to do, we were able to focus our instruction and assessment practices and develop guidelines and models for classroom-based evaluations of student performance.

Algebra tiles, graphing calculators, and problem solving were at the heart of almost every lesson. Students became engaged in lessons such as the following:

The Ball Bounce Activity

This lesson focuses on students making a hypothesis; for example, how does the height from which a ball (choice of ball left up to the student) is dropped affect the rebound height? Students begin by measuring rebound heights and organizing their information in a chart. After collecting their data, they graph the information and formulate conjectures based on their charts and graphs. Students then enter the data into the table function on the TI 82 calculators and graph their data again, comparing results of various groups.

We found that lessons like this develop mathematical models that help students in their construction of algebraic sense. We concentrated on designing questions to help students summarize specifically what they had learned. Student responses could then be used as assessment tools to help the teachers chart students' mathematical growth.

This program design gave us the opportunity to collect student data on a regular basis. As we gathered classroom-based evidence of student growth in algebraic concepts we were teaching, the data was used to indicate progress toward students' mastery of the essential learning designated in the state standards and tested on the state assessments.

In our team meetings, the eighth grade science teachers reported that students were applying the mathematics to the problems posed in their science classes. For the first time, teachers could see that the students had a grasp of the meaning of concepts such as slope and time/distance formulas when they were asked to use them in science. All of these assessment data were used to pave the way for student success on the Washington Assessment of Student Learning.

As my focus shifted, I realized that I was actively involved in the process of constructing my own professional development. I quickly realized that support from my administrators, other classroom teachers, and even my students was critical if I hoped to be successful in implementing sound instructional and assessment practice into my math classes.

My school district instituted team-planning time on Wednesday afternoons; I spent this time with another math teacher as immersed in implementing the reform effort as I was. Together we researched, examined, and developed lessons we thought reflected the Learning Requirements. After teaching these lessons, we spent team time in further discussions of pedagogy and assessment. This team planning time with my fellow teachers was one of the most powerful elements in our development of reform-based classrooms.

As the changes in my classroom unfolded, I got my students involved. I did this by including them in the process of evaluating and reflecting on the math they were learning. Their continual feedback in the form of journal writing and interviews revealed new ideas and practices.

After 20 years as a mathematics educator, I was re-energized as I observed my students monitoring their own thinking, persevering, and pushing the limits of their knowledge and ability. Keeping the students as the focus of my decisions was a guiding force and key to the success of the classroom changes I was making.

Students began to view the classroom as an environment where open, sincere communication was encouraged. The atmosphere helped them establish positive attitudes about their learning. The students became more involved in tasks related to the real world that were difficult enough to be interesting but not frustrating. Including them in their own assessment helped them realize the importance of monitoring their progress.

The new skills and processes I had incorporated shaped a classroom where effective learning occurred and skills beyond school were developed. In addition, a greater variety of assessments was available to gather valid information about each student's mathematical understanding. ◉

Currently, Mary Ann Stine is a mathematics specialist for the Office of Superintendent for Public Instruction for the state of Washington. She notes, "My personal experiences in developing a standards-based mathematics classroom have proven pivotal as I talk to and provide guidance to math teachers in the state of Washington. It is exciting when they, too, discover how to become successful with the state reform." Email her at mstine@ospi.wednet.edu

ALIGNING ASSESSMENT WITH LEARNING GOALS

Concerned about aligning assessment with national and state standards? Help is on its way from Project 2061.

by Natalie Nielsen, American Association for the Advancement of Science

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

By now, most educators are familiar with the standards movement. National learning goals specifying what students should know and be able to do in science and mathematics have been developed by Project 2061 of the American Association for the Advancement of Science (AAAS), the National Research Council, and the National Council of Teachers of Mathematics. In addition, most states have attempted to derive from these national goals their own standards or curriculum frameworks to guide their education reform efforts.

With these learning goals in place, researchers and educators have taken the next step to link standards and benchmarks to curriculum materials and instruction. But what about assessment, which exerts extraordinary influence on the lives of students and their families, and on every level of the education system?

A LACK OF GUIDANCE

Highly publicized, high-stakes tests are often the most visible indicator of education success or failure for political leaders, parents, and concerned citizens. Since this is unlikely to change, it is crucial for such assessments to be developed thoughtfully.

Nearly everyone recognizes that to effect meaningful improvement in science and mathematics education, curriculum and assessment have to be aligned with specific goals for specific learning. In addition to this alignment, *Blueprints*

About Project 2061

Begun in 1985 when Halley's Comet last appeared, Project 2061 takes its name from the year when the comet will again be visible from Earth.

Hailed by the Organization of Economic Cooperation and Development as the "single most visible attempt at science education reform in American history," Project 2061 of the American Association for the Advancement of Science is a long-term initiative to help reform K-12 education nationwide so that all high-school graduates are science literate.

Working with panels of scientists, mathematicians, and technologists, Project 2061 set out in 1985 to identify the basic knowledge and skills adults should have in five subject areas: biological and health sciences; mathematics; physical and information sciences and engineering; social and behavioral sciences; and technology. These learning goals were eventually integrated into the landmark document, Science for All Americans (1989).

In 1993, Project 2061 collaborated with teams of teachers from six carefully selected school districts to create *Benchmarks for Science Literacy,* a curriculum design tool that translates the literacy goals of *Science for All Americans* into expectations of what students should know at the ends of grades 2, 5, 8, and 12. Both documents have had a major impact on education, providing the foundation for national and state science education standards.

To assist educators in meeting science literacy goals in their own districts, Project 2061 is now developing a coordinated set of reform tools. For full information on available publications and services, visit the Project 2061 web site.

Project 2061/AAAS
1333 H Street, NW
Washington, DC 20005
(202) 326-6666 / Fax (202) 842-5196;
Email: project2061@aaas.org
www.project2061.org

Project 2061 is currently supported by grants from the Carnegie Corporation of New York, the Hewlett-Packard Company, the John D. and Catherine T. MacArthur Foundation, the Andrew W. Mellon Foundation, the Pew Charitable Trusts, and the National Science Foundation.

Summary of the Draft Project 2061 Assessment Analysis Procedure

The purpose of the procedure is to determine whether specific assessment tasks focus on ideas or skills in benchmarks and standards. Reviewers examine each assessment task including the scoring guides or rubrics.

If there is a content match with benchmarks and standards, reviewers proceed to the next step, in which they examine other assessment characteristics that, if present, will increase the likelihood that the assessment will actually find out what students know and can do. These characteristics include:

Depth of Understanding.
- Does the task avoid allowing students a trivial way out, like repeating a memorized term or following rote steps in a procedure?
- Are concepts or skills applied and connected in responding to the task (e.g., by asking students to explain phenomena or solve related problems)?

Usefulness.
- Does the task provide guidance to help the teacher interpret students' responses or scores?
- Are the scoring and other additional information that accompany the task helpful in modifying instruction?

Fairness.
- Can all students demonstrate what they know and are able to do?
- Are there alternative formats, a variety of contexts, or situations that are familiar to students from many backgrounds and to both genders?

for Reform: Science, Mathematics, and Technology Education (AAAS, 1998) recommends that assessments should:

- include a variety of techniques,
- encourage students to go beyond simple recall of data or facts,
- close the gap between the classroom and the real world, and
- include opportunities for students to perform tasks and solve problems.

As reasonable as these recommendations might appear, most assessments do not do these things. Furthermore, the classroom teachers, administrators, and test developers—those who are required to choose and develop assessments—have little to guide them. Although some 40 states are currently engaged in developing statewide assessments, Andrew Ahlgren, associate director of Project 2061, notes that there is "no useful synthesis of the latest thinking on assessment, much less practical advice on how to judge alignment of assessment with learning goals."

TOOLS FOR CHANGE

Project 2061 intends to provide some guidance. With a recent three-year, $2.4 million grant from the National Science Foundation, the project is gearing up to develop a guide on how to evaluate—and hopefully improve—the alignment of assessment to specific learning goals. Project 2061 intends to:

- develop criteria and an analysis procedure for judging alignment of assessment tasks to specific learning goals (see sidebar on this page for a summary of the draft procedure); and
- produce case studies to illustrate the use of the criteria to revise existing assessment tasks and create new ones.

According to Ahlgren, "This guidance will also be useful to classroom teachers who are required to develop and assemble their own tests, interpret students' responses, and make instructional decisions based on those responses." Together with the project's other reform tools, the assessment guide will offer educators the opportunity to make well-coordinated improvements in science and mathematics education for all students. ●

REFERENCES

American Association for the Advancement of Science (1989). *Science for all Americans.* New York: Oxford University Press.

American Association for the Advancement of Science (1993). *Benchmarks for Science Literacy.* New York: Oxford University Press.

American Association for the Advancement of Science (1998). *Blueprints for Reform: Science, Mathematics, and Technology Education.* New York: Oxford University Press.

Natalie Nielsen, a writer with Project 2061, is currently a doctoral student in education at George Mason University in Fairfax, Virginia.

Focus on the Collection:

Finding Materials to Meaningfully Assess Students

by Terese Herrera and Carol Damian, ENC Instructional Resource

Like many classroom innovators today, you may be faced with the tension between the reality of high-stakes testing and the kinds of assessment that are embedded in your everyday teaching and learning. The resources selected for this issue do not offer the "magic bullet" for helping students pass standardized achievement tests—not directly, at least. We do not know of any one resource that would prepare your students to pass your state test. Each state, even each district, has its own approach to testing student achievement.

What we have included are materials that guide the classroom innovator toward useful assessment—assessment that informs teachers' instruction and helps students share in the responsibility for their own learning progress. In our selection we were concerned with assessment strategies that:

- reflect the vision of the national standards;
- promote equal opportunities to advance in math and science, rather than to set up barriers to further study;
- engage students in purposeful activities that enhance learning;
- provide evidence of progress from multiple sources;
- judge progress toward math and science literacy; and
- recognize achievement and identify areas for growth.

The resources were chosen with various purposes in mind. Some provide background and general guidelines, while others will help you design professional development, either through study groups or workshops. Also featured are materials on skills needed for particular methods, such as how to organize portfolios. In addition, you will find curricular programs with exemplary assessment components that may be easily adapted for use in your classroom. Finally, we tried to select materials that range from primary to secondary, from computers to role-playing, and from classroom goals to national standards.

Please note that this section is based on abstracts found in ENC's database of K-12 materials. All ENC abstracts are descriptions rather than evaluative reviews. If you search the full collection of materials through ENC Online (enc.org) you will find complete records for these selections. Some records provide links to online, third-party reviews and/or references to journal reviews. Pricing and ordering information was verified in December, 1999, and is subject to change.

For Further Reading...

...check out page 82 for an annotated list of articles on the subject of assessment in mathematics and science.

FEATURED RESOURCES

IDEAS ON WHAT CONSTITUTES GOOD ASSESSMENT

These resources present the foundational ideas that support standards-based mathematics and science assessment. Here you will find the large vision for reform and its rationale.

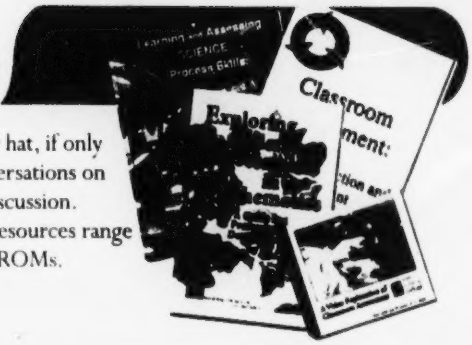
Assessment Standards for School Mathematics (Grades K-12) 53
National Science Education Standards (Grades K-12) 53
Measuring Up: Prototypes for Mathematics Assessment (Grades K-12) 54
Assessment in the Mathematics Classroom (Grades K-12) 54
Focusing on Classroom Assessment (Grades K-12) 54

STUDY GROUP MATERIALS

Critical components of effective science and math teaching include reflective thinking by individual teachers and collaborative efforts among teachers. In this section we are suggesting materials that small informal groups of teachers can use to guide further learning about assessment possibilities, promote reflection on present practices, and encourage collaborative discussions about what assessment methods may be of value to you, your colleagues, and your students.

An Assessment Sampler: A Resource for Elementary School Teachers, Administrators, and Staff Developers (Grades K-8) 55
Student-Generated Rubrics: An Assessment Model to Help All Students Succeed (Grades K-8) 55
Portfolios Across the Curriculum and Beyond (Grades K-12) 56
Mathematics Education Dialogues (Grades K-12) 56
Developing Judgment: Assessing Children's Work in Mathematics (Grades 1-5) 56
Science Educator's Guide to Assessment (Grades K-12) 57
Sparking the Thinking of Students, Ages 10-14: Strategies for Teachers (Grades 5-9) 57
Learning from Assessment: Tools for Examining Assessment Through Standards (Grades 5-8) 58
Effective Assessments: Making Use of Local Context (Grades K-12) 58
Mathematics: Assessing Understanding (Grades K-7) 58
The Balancing Act: A Multiple Intelligences Approach to Curriculum, Instruction, and Assessment (Grades 1-12) 59
A Handbook for Student Performance Assessment in an Era of Restructuring (Grades K-12) 59

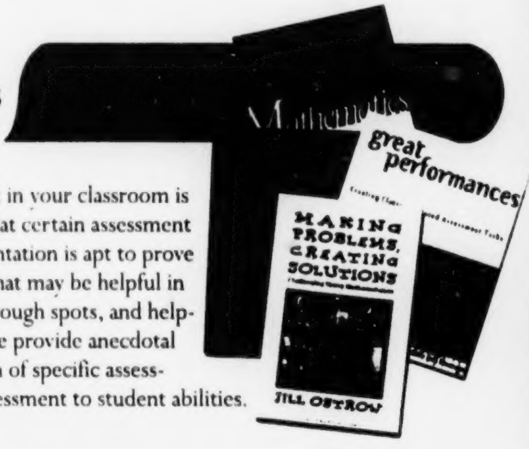
WORKSHOP MATERIALS FOR PROFESSIONAL DEVELOPMENT



Those of you who wear the professional developer hat, if only occasionally, can use these materials to begin conversations on issues of assessment and then encourage deeper discussion. Designed to support the workshop setting, these resources range from in-the-hand notebooks to videotapes to CD-ROMs.

Improving Classroom Assessment: A Toolkit for Professional Developers (Grades K-12) 60
Assessing Student Understanding (Grades K-12) 60
Learning About Assessment, Learning Through Assessment (Grades K-12) 61
Mathematics Assessment, A Video Library, K-12 (Grades K-12) 61
Classroom Assessment: Linking Instruction and Assessment (Grades K-12) 62
Learning and Assessing Science Process Skills (Grades K-8) 62
Performance-Based Curriculum for Science (Grades K-12) 63
Garnetta Chain; Assessment (Grades K-5) 63
Exploring Classroom Assessment in Mathematics: A Guide for Professional Development (Grades K-12) 64
Teacher Change: Improving K-12 Mathematics (Grades K-12) 64
A Video Exploration of Classroom Assessment (Grades K-12) 64

PRACTICAL SKILLS FOR TEACHERS



Implementing multiple methods of assessment in your classroom is not easy. Even though we may be convinced that certain assessment strategies are worthwhile, the actual implementation is apt to prove difficult. Here we have listed some materials that may be helpful in getting you started, assisting you through the rough spots, and helping you recognize what can be improved. Some provide anecdotal classroom examples, some illustrate the design of specific assessment tools, and some may help you match assessment to student abilities.

Mathematics Assessment: A Practical Handbook for Grades 9-12 (Grades 9-12) 65
Great Performances: Creating Classroom-Based Assessment Tasks (Grades K-12) 65
A Collection of Performance Tasks and Rubrics: Primary School Mathematics (Grades K-3) 66
A Collection of Performance Tasks and Rubrics: Upper Elementary School Mathematics (Grades 3-5) 66
A Collection of Performance Tasks and Rubrics: Middle School Mathematics (Grades 6-8) 66
A Collection of Performance Tasks and Rubrics: High School Mathematics (Grades 9-12) 67
Portfolios in the Classroom: Tools for Learning and Instruction (Grades K-8) 67
The Best of Math Exemplars (Grades K-8) 67
Secondary Exemplars (Grades 9-12) 68
Making Problems, Creating Solutions: Challenging Young Mathematicians (Grades 1-6) 68
TechPaths for Math (Grades K-8) 68
Science and Writing Connections (Grades 6-9) 69
Open-Ended Questioning: A Handbook for Educators (Grades K-12) 69
Error Patterns in Computation (Grades 1-9) 70

Visit enc.org

Assessment Techniques (Grades K and 2) 70
Balanced Assessment for the Mathematics Curriculum, Middle Grades, Assessment Package 1 (Grades 6-9) 71
Balanced Assessment for the Mathematics Curriculum, Middle Grades, Assessment Package 2 (Grades 6-9) 71

CURRICULUM PACKAGES WITH A STRONG ASSESSMENT COMPONENT

In this section we give examples of how alignment between instruction and assessment could look in the day-to-day curriculum. We want to re-emphasize that this list is not comprehensive. These are only samples, highlighted here to give an idea of what is presently available to schools.

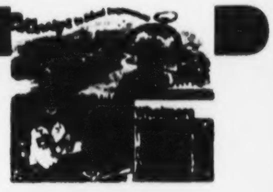
MATHEMATICS

Puddle Questions: Assessing Mathematical Thinking, Grade 5 (Grade 5) 72
Number Power, Grade 3 (Grade 3) 72
Designing Spaces: Visualizing, Planning, and Building (Grades 6 and 7) 72
Survey Questions and Secret Rules: Collecting and Sorting Data (Grade 1) 73
Thinking with Mathematical Models: Representing Relationships (Grade 8) 73
Contemporary Mathematics in Context, Course 2 (Grades 10-12) 74
College Preparatory Mathematics 4 (Math Analysis) (Grades 11 and 12) 74

SCIENCE

Puddle Questions for Science: Performance Assessment Investigations, Grade 6 (Grade 6) 75
Insights & Outcomes: Assessments for Great Explorations in Math and Science (Grades Pre-K-10) 75
Investigating the Changing Earth (Grade 4) 75
Change Over Time (Grade 5) 76
DASH, Grade 3 (Grade 3) 76
There Is No Away (Grade 6) 77
Hard As Ice: A Unit About Lakes & Rivers, Melting & Freezing, and Molecules (Grades 5 and 6) 77
Science Interactions, Course 2 (Grade 7) 78
Outbreak! (Grades 5-9) 78
Biology, a Community Context (Grades 9, 10) 79
Chemistry: Connections to Our Changing World (Grades 10 and 11) 79

INTERNET SITES



Here is a carefully selected list of Internet sites that address classroom instruction and assessment issues. They provide a wide array of research results, ideas, and discussion points for teachers, and activities to try with your students or colleagues.

National Center for Research on Evaluation, Standards, and Student Testing (Grades K-12) 80
The pH Factor (Grades K-12) 80
Assessment & Accountability Program (Grades K-12) 80
ERIC Clearinghouse on Assessment and Evaluation World Wide Web Home Page (Grades K-12) 81
Whelmers (Grades K-12) 81
Pathways to School Improvement (Grades K-12) 81
Practical Assessment, Research and Evaluation (PARE): A Peer-Reviewed Electronic Journal (Grades K-12) 81

IDEAS ON WHAT CONSTITUTES GOOD ASSESSMENT

These resources present the foundational ideas that support standards-based mathematics and science assessment. Here you will find the large vision for reform and its rationale.

Assessment Standards for School Mathematics

Grades K-12
1995
Author: prepared by the Assessment Standards Working Groups of the National Council of Teachers of Mathematics

Ordering Information
National Council of Teachers of Mathematics, Inc.
1906 Association Drive, Drawer A
Reston, VA 20191-1593
(703) 620-9840 / Fax: (703) 476-2970
Toll-free: (800) 235-7566
Email: orders@nctm.org
www.nctm.org

$18.75 per book
Order # 593
Note: NCTM members receive a 20% discount.

Standards: NCTM Assessment Standards (1995)

This is the third book in the NCTM *Standards* series and was developed as a guide for examining current assessment practices and planning new ones. It is based on extensive recent research and developments in national efforts to reform the teaching and learning of mathematics. In particular, the 1993 report from the Mathematics Sciences Education Board (MSEB), *Measuring What Counts*, provided an initial scholarly base for the development of these assessment standards. Instead of assuming that the purpose of assessment is to rank students on a particular trait, the new approach suggests that teachers can set high expectations every student can achieve. It also suggests that different performances can and will meet agreed on expectations, and that teachers can be fair and consistent judges of students' performances. An important theme in the *Assessment Standards* is that assessment of student achievement should be based on information obtained from a variety of sources, and that much of this information should be gathered by teachers during the process of instruction. Six standards for assessment are described: mathematics, learning, equity, openness, inferences, and coherence. At the end of the discussion of each standard, focus questions are provided to facilitate the application of that standard. Four purposes for assessment are also discussed and examples of each provided: monitoring students' progress, making instructional decisions, evaluating students' achievement, and evaluating programs. A final section, What's Next, provides suggestions for how the guide can be used and for changes in current assessment practices. The guide also contains a glossary of terms and a selected assessment bibliography. (Author/GMM) ENC-003554

National Science Education Standards

Grades K-12
1995
Author: National Research Council

Ordering Information
National Academy Press
2101 Constitution Avenue NW
Washington, DC 20418
(202) 334-2334 / Fax: (202) 334-2793
Toll-free: (800) 624-6242
www.nap.edu

$19.95 per book (paperback)
Note: Bulk order discounts available. Call for information.

Standards: National Science Education Standards (December 1995)

The *National Science Education Standards* present a vision of a scientifically literate populace. The standards espouse that science is for all students, learning science is an active process, and improving science education is part of systemic education reform. In addition, the standards describe an educational system in which all students demonstrate high levels of performance, in which teachers are empowered to make the decisions essential for effective learning, and in which supportive educational programs and systems nurture achievement. The introduction includes goals for school science, underlying principles, perspectives and definitions, and six categories of standards. The standards cover the topics of science teaching, professional development, assessment, science content, science programs, and systems. They describe the conditions necessary to achieve the goal of scientific literacy for all students, including opportunities for students to learn and for teachers to teach. The standards for teaching focus on what teachers know and do, while those for professional development focus on how teachers develop professional knowledge and skill. The science assessment standards are criteria against which to judge the quality of assessment practices, they can be used as guides in developing assessment practices and policy. The standards for content define what the scientifically literate person should understand and be able to do after 13 years of schooling. The science education system standards provide criteria for evaluating how well the science education system does at providing schools with the necessary resources for achieving the national standards. Samples, vignettes, and references are provided. (Author/KSR) ENC-006101

Measuring Up: Prototypes for
Assessment

Perspectives on School Series

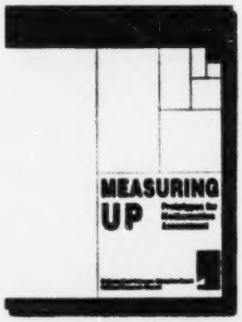
Grades K-12
1993
Author: National Research Council

Ordering Information
National Academy Press
Lockbox 285
2101 Constitution Avenue NW
Washington DC 20055
(202) 334-3313 / Fax (202) 334-2451
Toll-free (800) 624-6242
www nap edu

$10.95 per book (paperback)
Note Bulk discounts available
Contact publisher for information

Standards: NCTM Curriculum and Evaluation Standards (1989)

Test developers, teachers, and university-based teacher educators can use this book to find examples of tasks, hypothetically directed towards the fourth grade level, that can be used to assess mathematical skills and knowledge as expressed in the NCTM Curriculum and Evaluation Standards (1989). The nature and selection of the prototypes in this volume are based on mathematical content, connections, and communication. The 13 tasks are generally organized as a sequence of questions, often in order of increasing difficulty and presented in several formats. Many of the tasks involve problem solving, communication, and reasoning. These tasks require the student to explain underlying patterns, relationships, or reasoning. Part of the organization of each task includes time allotment, student grouping, assumed background, rationale, and a rough scoring system. One example of an included task is Lightning Strikes Again. In the problem scenario, four people see lightning strike at a point but because sound travels more slowly than light, they did not hear the thunder right away. One question asks who heard the thunder first and why. Students are asked to show on the map where the lightning might have struck. A bibliography is included. (Author/LDR) ENC-007090



Assessment in the Mathematics

NCTM Yearbook Series

Grades K-12
1993
Author: editor, Norman L. Webb

Ordering Information
National Council of Teachers of
Mathematics, Inc
1906 Association Drive, Drawer A
Reston, VA 20191-1593
(703) 620-9840 / Fax (703) 476-2970
Toll-free (800) 235-7566
Email orders@nctm org
www nctm org

$23.50 per book
Order # 513
Note 20% discount for NCTM members

Standards: NCTM Professional Standards (1991), NCTM Assessment Standards (1995)

Grounded in the vision of reform expressed in NCTM's *Curriculum and Evaluation Standards for School Mathematics* (1989) and *Professional Standards For Teaching Mathematics* (1991), this yearbook addresses assessment in K-12 mathematics classrooms. It is also a response to the many teachers who value change but who need concrete ideas to make it happen. To meet this need, articles selected for the yearbook had to have clear implications for classroom practice. Articles were accepted if they were deemed effective in communicating the view that assessment must be integral to instruction, must support good instructional practice, and must be a multidimensional process that takes a variety of forms. Whenever possible, the articles include samples of student work and teacher interpretations. The articles can be grouped into three broad areas of interest: techniques of assessment, management of assessment, and issues and perspectives pertinent to classroom assessment. The goal for this yearbook is that it will positively influence the process of change in assessment practices in the mathematics classroom. (Author/KFR) ENC-004608

Focusing on Classroom Assessment

Grades K-12
1998
Author: Jeane M. Joyner, George W. Bright

Ordering Information
University of North Carolina at
Greensboro
School of Education
PO Box 26171
Greensboro, NC 27402-6171
www uncg edu/soe/

$8.50 per book
Note Shipping $2.00 plus $1.00 each additional copy. Check only, made out to University of North Carolina at Greensboro

Teachers can read this book for an overview of the assessment process and a description of how they can use classroom assessment as a powerful tool to improve instruction. The first chapter describes a three-part process for implementing classroom assessment: clarify its role in instructional planning; gather evidence and make inferences about student performance; and use assessment to make decisions and take action. Subsequent chapters examine each dimension of assessment in greater detail. The chapter on gathering evidence, for example, discusses traditional and alternative assessment strategies, such as selected response (multiple choice and matching), student-constructed responses, and rubrics for assessing performance tasks, products, and creative works. Additional strategies include checklists, interviews, and portfolios. For each strategy, the authors describe its uses and disadvantages, sample questions or tasks, and teacher stories as illustrations. The book also provides ideas and sample forms intended to help teachers implement new assessment strategies into their classrooms. (Author/LCT) ENC-014442

Focusing on Classroom Assessment

STUDY GROUP MATERIALS

Critical components of effective science and math teaching include reflective thinking by individual teachers and collaborative efforts among teachers. In this section we are suggesting materials that small informal groups of teachers can use to guide further learning about assessment possibilities, promote reflection on present practices, and encourage collaborative discussions about what assessment methods may be of value to you, your colleagues, and your students.

An Assessment Sampler: A Resource for Elementary School Teachers, Administrators, and Staff Developers

Grades K-8
1999
Author: Edward Chittenden, Rosalea Courtney, Carole Stearns
Publisher: Merck Institute for Science Education

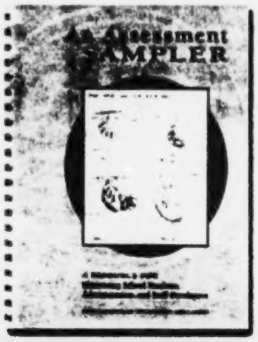
Ordering Information
Make check or money order payable to: Merck Institute for Science Education

Mail with shipping instructions to
Post Haste Mailing
90 Russell Street
Suite 100
Annapolis, MD 21401

or fax credit card no., exp. date, shipping instructions, and phone to:
(410) 267-6006
Credit card charges will be billed to Post Haste Mailing

$10.00 per book (includes S&H)

Compiled to disseminate the design and outcomes of the Assessment Project, an initiative of the Partnership for Systemic Change, this book provides an overview of the project, analysis of participating teachers' reflections, and examples of assessment tasks they designed as part of their inquiry-based instruction. The Assessment Project was a collaboration between school districts and the Merck Institute for Science Education, and it emphasized professional development through investigation of assessment alternatives. It allowed teachers to design and field test their tasks and reflect with colleagues and project staff what the assessments revealed about the students' science understanding. The first two sections of the book highlight the details of the project, the professional development outcomes, and the teachers' reflections on the development process and the execution of their inquiry-based assessments. These sections explain how the teachers considered the formative and summative goals of the assessments and how the assessments could be customized to fit specific learning situations. Issues of parental involvement, documentation, and evaluation are addressed. The largest section of the book contains 17 assessment tasks that illustrate the variety of methods the teachers used, such as performance tasks, journal entries, and writing and drawing prompts. Each entry contains a statement of the assessment's purpose that is referenced to national standards, along with a description of the procedure and teachers' reflections and recommendations. Samples of student work, complete with teacher comments, are provided for each task. (Author/JR) ENC-016097



Student-Generated Rubrics: An Assessment Model to Help All Students Succeed

Assessment Bookshelf Series

Grades K-8
1998
Author: Larry Ainsworth and Jan Christinson

Ordering Information
Dale Seymour Publications
4350 Equity Drive
Columbus, OH 43228
Toll-free: (800) 321-3106
www.cuisenaire-dsp.com

$15.95 per book (paperback)

Part of the Assessment Bookshelf Series, this book presents a model of alternative assessment that involves students in generating rubrics for evaluating performance tasks. The first chapter presents the model, which uses a seven-step process in which the teacher establishes the focus questions, selects a performance task, and chooses learning activities to match the focus questions. The opening chapter also provides a brief introduction to alternative and authentic assessment, rubrics, and a rationale for using student input to develop rubrics. In addition to teaching students how to write rubrics and carry out the assessment, separate chapters provide guidelines specific to primary and intermediate grades. Prior to beginning their project, students work with the teacher to create a task-specific scoring rubric to evaluate their performance. When the tasks are complete, students use the rubric to evaluate their own work and the work of their peers. The teacher reviews the student assessments and determines the final grade for each project, and then the students reflect upon their performance by compiling unit folders and sharing them with their parents. The book's final chapters contain a general plan for a two-day staff development workshop and 10 sample focus questions, tasks, and rubrics. The kindergarten task, for example, asks students to draw three pictures that illustrate the beginning, middle, and end of a story. Grade 3 students are asked to identify four major regions of their home state and describe the inhabitants, climate, and land of one region. For this task, a three-tiered rubric establishes criteria that include a map, illustrations, and progressively more detailed narrative text. Other tasks integrate mathematics, science, language arts, and geography. Also provided are blackline masters, parent letters, and sample rubric forms. (Author/LCT) ENC-016061

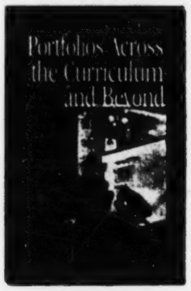
Portfolios Across the Curriculum and Beyond

Grades K-12
2000
Author: Donna J. Cole, Charles W. Ryan, Fran Kick, Bonnie K. Mathies

Ordering Information
Corwin Press, Inc.
2455 Teller Road
Thousand Oaks, CA 91320-2218
(805) 499-9774 / Fax: (800) 417-2466
Email: order@corwinpress.com
www.corwinpress.com

$18.95 per book (paperback)

The guidelines in this book provide assistance in using portfolios that incorporate current teaching practices and educational technology. The first chapter details the rationale and purpose of portfolios as a form of nontraditional assessment. It also highlights the link between portfolios and educational reform movements. Subsequent chapters describe a strategy for implementation to assist faculty and administrators that includes communicating with parents and community agencies. The book presents a number of portfolio models to illustrate varying subject matter possibilities for systematic infusion into schools. The authors also discuss the potential of multimedia technology in developing portfolios. The final chapter outlines a portfolio process to assist teachers and administrators with their personal professional growth. Each chapter begins with a list of learning objectives and concludes with a brief summary. Bibliographic references are included. (Author/LCT) ENC-016142



Mathematics Education Dialogues

Grades K-12
1998
Author: National Council of Teachers of Mathematics (NCTM)

Ordering Information
National Council of Teachers of Mathematics, Inc
1906 Association Drive, Drawer A
Reston, VA 20191-1593
(703) 620-9840 / Fax: (703) 476-2970
Toll-free: (800) 235-7566
Email: orders@nctm.org
www.nctm.org

$5.00 per newsletter
Order # 07985D
Note: Back issues sold in bundles of 25. Available while supplies last. First bundle $5.00, additional bundles $2.50 each. Subscription to newsletter free with NCTM membership.

This NCTM newsletter offers viewpoints from experienced teachers on high-stakes testing and its impact on the mathematics curriculum. It is part of a series of ongoing topical newsletters designed to offer a forum through which NCTM members can be informed and share ideas about timely issues in K-12 mathematics education. This newsletter gives a historical perspective on high-stakes testing and addresses this question: Should high-stakes tests drive mathematics curriculum and instruction? Response essays were written by teachers and other individuals with a special interest in assessment. Writers from the United States, Canada, and China contributed essays that address the stated question and relate high-stakes testing to other issues, including state standards, the constructivist approach to teaching, teacher accountability, and degree of rigor in mathematics education. Also found are reader responses to questions posed in earlier issues of *Dialogues*. (Author/JRS) ENC-016066

Dialogues
This Is a Test.
It Is Only a Test ...

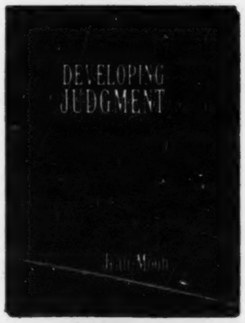
Developing Judgment: Assessing Children's Work in Mathematics

Grades 1-5
1997
Author: Jean Moon

Ordering Information
Greenwood Publishing/Heinemann
Educational Books Inc
88 Post Road West
PO Box 5007
Westport, CT 06881-5007
(603) 431-7894 / Fax: (800) 203-1502
Toll-free: (800) 225-5800
Email: custserv@heinemann.com
www.greenwood.com

$22.00 per book (paperback)

Teachers of grades 1-8 can use this professional development book to improve their judgment in evaluating alternative assessment work. The book presents selected examples of student work in mathematics and offers guided interpretations of that work. The author believes that teachers need to build expertise in examining student work in order to apply alternative assessment to mathematics in their classrooms. The book is organized into chapters that parallel a series of sessions undertaken by a study group of seven elementary school teachers and two principals. Each session deals with a major idea related to judging student work, such as determining what constitutes a good classroom assessment activity. Discussion follows that addresses how that idea plays out in instruction, curriculum, and assessment. Session elements include: background information, goals and a sequence of the study group's activities, suggestions for conducting the session on your own, excerpts from the study group's conversations, and the author's reflections on those conversations. A list of references is included. (Author/JRS) ENC-011846



Science Educator's Guide to Assessment

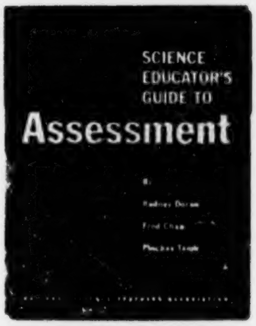
Grades K-12
1998
Author: Rodney Doran, Fred Chan, Pichas Tamir

Ordering Information
National Science Teachers Association
The Science Store
1840 Wilson Blvd
Arlington, VA 22201-3000
(703) 243-7100 / Fax: (703) 522-6091
Toll-free: (800) 722-6782
Email: science.scope@nsta.org

$27.95 per book (paperback)
Order # PB145X

Standards: Benchmarks for Science Literacy; National Science Education Standards (December 1995); Project 2061 (1985)

Science teachers of all grade levels can use this book to learn how assessment can be used to give students regular and accurate feedback on their strengths and weaknesses in learning. The book also discusses how assessment can reinforce productive learning habits and how it can help students reflect on their own learning. Chapter one presents the *National Science Education Standards* (NSES, 1996) and reviews research advocating that instruction move from a primarily behaviorist approach toward constructivist models of learning and instruction. The second chapter addresses practical issues related to designing performance assessments that are aligned with the NSES. Chapter three discusses the benefits and drawbacks of various assessment formats, ranging from short, focused tasks to extended investigations. In chapter four are suggestions for using rubrics to establish reliable and consistent scoring of assessments, and for using data to improve both the overall science program and student performance. The remaining four chapters provide sample assessments for biology, chemistry, Earth science, and physics. Most of these assessments are performance tasks; some are short tasks that focus on a few specific process skills, while others are extended inquiries that require students to plan and design an investigation, conduct an experiment, and communicate their findings and conclusions. Each assessment includes information about measuring the skills appropriate for each task, time requirements, and preparing materials and equipment. There are also directions and answer sheets for students and scoring guidelines for evaluating student responses. The appendices provide a summary of the NSES, a glossary, and bibliographic references. (Author/LCT) ENC-014470



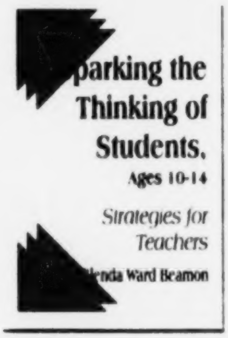
Sparking the Thinking of Students, Ages 10-14: Strategies for Teachers

Grades 5-9
1997
Author: Glenda Ward Beamon

Ordering Information
Corwin Press, Inc.
2455 Teller Road
Thousand Oaks, CA 91320-2218
(805) 499-9774 / Fax: (800) 417-2466
Email: order@corwinpress.com
www.corwinpress.com

$22.95 per book (paperback)

In this book, teachers can find out how a classroom program called Safe for Thinking can be a vehicle for improving and expanding critical thinking skills in their adolescent students. The strategies offered by this program are based on cognitive research and adolescent development theory and provide guidance on questioning and assessing students' progress and connecting the curriculum with the real world. There are practical examples of how the establishment of the Safe for Thinking climate affects the classroom dynamics as students are encouraged to improve their thinking processes, learn to evaluate their own thinking skills, and progress in their ability to problem solve and generalize. Sample classroom scenarios include a collaborative problem-solving approach in a grade 8 mathematics classroom; a multiple-intelligence approach in grade 6 science class; and use of technology in grade 9. Chapter five explores the challenge of meaningful assessment of students' thinking processes and progress. The first issue addressed is how to assess students' thinking skills development. Here, the author emphasizes the need for ongoing assessment that is closely linked to the planning goals of the lesson and the appropriate classroom procedures. The second issue is the difference between norm-referenced testing and the assessment of thinking development. The author provides arguments for parents, educators, and others to adopt process assessment as the best means of helping students' thinking skills improve. Later chapters look at instructional methods that will help students make the developmental transition toward responsibility and leadership. A reference list is included. (Author/JRS) ENC-014818



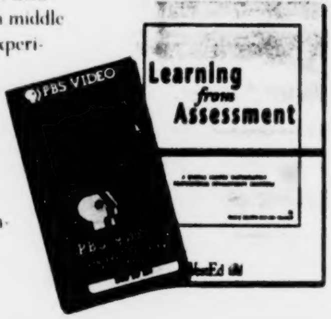
Learning from Assessment: Tools for Examining Assessment Through Standards

Grades 5-8
1999
Author: Tania J. Madfes and Ann Muench

Ordering Information
WestEd Eisenhower Regional
Consortium for Science and
Mathematics Education
Publications
730 Harrison Street
San Francisco, CA 94107-1242
(415) 565-3044 / Fax: (415) 565-3012
www.wested.org

$31.00 per kit (text + video)
Order # LfA9901

Professional developers and teacher leaders can use this kit to help middle school teachers bridge standards and classroom practice. The kit contains materials for three modules with two-hour sessions in which teachers examine the interrelationships among assessment, standards, and instruction to improve student achievement in mathematics. Items from large-scale assessment projects such as the Third International Math and Science Study (TIMSS) and the National Assessment of Educational Practice (NAEP) are used as focal points for discussing critical issues that support student learning. Participants work together to clarify the meaning of standards on both local and national levels. They also evaluate assessment tools in terms of their alignment with mathematics standards in middle school, and they plan student learning experiences that reflect standards-based teaching. Included are suggestions for using the Mathline video Hop to It! to show how a grade 8 TIMSS item can be used to probe student thinking. Facilitator support materials include planning tools, masters for all transparencies and handouts, four supplementary activities, and selected references. (Author/JRS) ENC-016033



Effective Assessments: Making Use of Local Context

Grades K-12
1995
Author: executive producer, Stanley Chow

Ordering Information
WestEd Eisenhower Regional
Consortium for Science and
Mathematics Education
Publications
730 Harrison Street
San Francisco, CA 94107-1242
(415) 565-3044 / Fax: (415) 565-3012
www.wested.org

$10.00 per video
Order #VD-95-01

For teachers interested in reevaluating their assessment strategies, this video provides examples of situations in which strategies have been modified for specific situations, as well as five principles to guide the design of effective assessments. In the video, practicing teachers express their desire to have methods to discern what the students have learned. One teacher, for example, believes all students are gifted, and she wants to figure out a way to expose their talents. Scenarios are presented that show teachers modifying state assessments to make them culturally sensitive, developmentally appropriate, and relevant to the students. In one predesigned assessment, the students are supposed to determine the number and types of fish to purchase for an aquarium. To make it more relevant to Native American students in Arizona, the teachers decided to change the assessment to be about types of horses to place in a corral of a given size. (Author/JR) ENC-015936

Mathematics: Assessing Understanding

Grades K-7
1993
Author: developed by Marilyn Burns

Ordering Information
Dale Seymour Publications
4350 Equity Drive
Columbus, OH 43228
Toll-free: (800) 321-3106
www.cuisenaire-dsp.com

$225.00 per set (3 videos + guide)

Standards: NCTM Curriculum and Evaluation Standards (1989); NCTM Professional Standards (1991)

This series of three videos and a discussion guide is a resource for planning and delivering workshops for those educators interested in assessing students in accordance with recommendations found in the NCTM *Curriculum and Evaluation Standards for School Mathematics* (1989) and *Professional Standards for Teaching Mathematics* (1991). Interviews with students illustrate the kinds of questions that can reveal what students do and do not understand, including their ability to apply numerical understanding to problem-solving situations and to explain their reasoning. The videos also show how to use wait time to allow students to think through and reconsider responses, how to probe students' thinking and reasoning, and how to follow students' leads to encourage them to reveal their knowledge. In part one, interviews with children seven to nine years of age reveal their number sense and understanding of the place value structure of the number system. Part two focuses on 10-year-olds' ability to estimate, reason numerically, and compute with whole numbers in problem-solving situations. In part three, viewers take an in-depth look at one twelve-year-old's process of thinking and reasoning about fractions. The discussion guide describes the problems used for individual assessments, presents analyses of each interview, and provides guidelines for teacher discussion. Suggested directions for workshop planning and implementation are also provided. (Author/GMM) ENC-005710

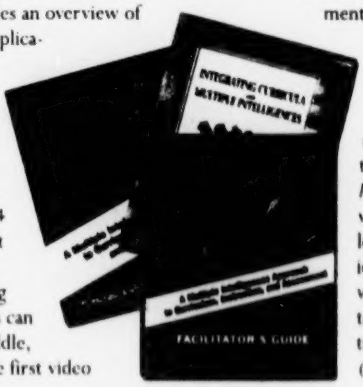
MATHEMATICS:
ASSESSMENTS
PARTS 1-3

The Balancing Act: A Multiple Intelligences Approach to Curriculum, Instruction, and Assessment

Grades 1-12
1995
Author: writer and director, Bob Risher
Publisher: IRI/SkyLight Training and Publishing, Inc., and the Training Works

Ordering Information
National Educational Service
1252 Loesch Road
Bloomington, IN 47404-9107
(812) 336-7700 / Fax: (812) 336-7790
Toll-free: (800) 733-6786
Email: nes@nesonline.com
www.nesonline.com

$395.00 per set (4 videos + 2 texts)
Order # 9903V3-VIF00057



The central focus of this professional development kit is on Howard Gardner's seven multiple intelligences—verbal, logical, musical, visual, bodily, interpersonal, and intrapersonal—and their implications for classroom instruction. The kit provides an overview of the theory, discusses its applications, and addresses the benefits of using Gardner's intelligences as a central aspect of curriculum, instruction, and assessment. The training guide outlines up to 14 hours of staff development sessions centered on four 15- minute videos showing how multiple intelligences can be used in elementary, middle, and high school classes. The first video introduces multiple intelligences theory and discusses its impact on student learning. The other three videos show how multiple intelligences are applied by students and teachers in three different classroom settings. In the elementary school video, students react to a favorite poem by constructing individual dragons that incorporate simple machines. In a presentation to the class, each student explains how his or her dragon was constructed and displays a pictorial graph showing how many simple machines are used in the dragon. Also found in this kit is the book *Integrating Curriculum with Multiple Intelligences*, which is used during the training sessions. It offers lesson activities, integrated thematic units, and ideas for linking classroom themes to the seven ways of knowing, learning, and assessing. The facilitator's guide also includes blackline masters for the training sessions and a list of additional resources. (Author/JRS) ENC-015994

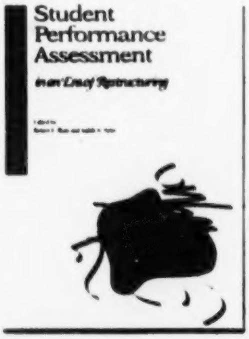
A Handbook for Student Performance Assessment in an Era of Restructuring

Grades K-12
1996
Author: edited by Robert E. Blum and Judith A. Arter

Ordering Information
Association for Supervision and
  Curriculum Development
1703 North Beauregard Street
Alexandria, VA 22311-1714
(703) 578-9600 / Fax: (703) 575-5400
Toll-free: (800) 933-2723
Email: member@ascd.org
www.ascd.org

$140.00 per notebook
Order # 196020J70
Note: $120.00 for ASCD members

The collection of papers in this handbook provides a resource for learning about performance assessment in the context of school restructuring. Section I provides information on general assessment issues, such as the definitions of assessment terms, the rationale for emphasizing alternative assessments, and technical issues surrounding performance assessment. Section II begins by clarifying goals for students and proceeds to designing learning and teaching experiences, assessment procedures, and school culture that align with those goals. The papers in Section III examine student outcomes and goals, provide information on current visions of what students should learn in various subjects, and discuss procedures for building consensus about student learning. The other sections present views on what it means to integrate assessment with instruction; examine the details of designing performance tasks and criteria; and address the use of performance assessment to improve learning. The book concludes with guidelines for implementing performance assessment and offers four examples of performance assessments for elementary, middle, and high schools. Each example includes a description of the task and performance criteria, copies of evaluation criteria, and samples of student work. A glossary, bibliography, and index of contributors are provided. (Author/LCT) ENC-015728



Like what you see here? Want to see more? The full-length catalog records for these materials and more on the same subject can be found by searching ENC's online database of more than 16,000 curriculum resources. Each record contains information such as a descriptive abstract, complete table of contents, information on funding sources, and—where available—links to third-party reviews and/or references to journal reviews. In many cases, you can also access the web site of the resource publisher and place orders directly. Go to ENC Online (enc.org) for more information.

WORKSHOP MATERIALS FOR PROFESSIONAL DEVELOPMENT

Those of you who wear the professional developer hat, if only occasionally, can use these materials to begin conversations on issues of assessment and then encourage deeper discussion. Designed to support the workshop setting, these resources range from in-the-hand notebooks to videotapes to CD-ROMs.

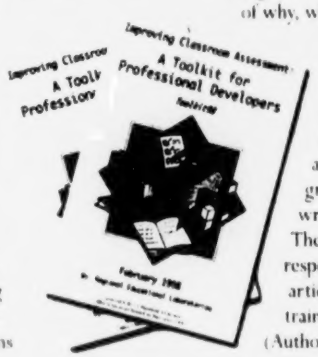
Improving Classroom Assessment: A Toolkit for Professional Developers (Toolkit98)

Grades K-12
1998
Author: Regional Educational Laboratories

Ordering Information
Northwest Regional Educational Laboratory
Document Reproduction Service
101 SW Main Street, Suite 500
Portland, OR 97204-3297
(503) 275-9519 / Fax: (503) 275-9489
Toll-free: (800) 547-6339
Email: products@nwrel.org
www.nwrel.org/comm/database/singlepublication.asp?id=604

$66.50 per toolkit (text and Windows-only CD-ROM)

Developed for teacher trainers, this two-volume set of workshop materials focuses on performance-based instruction and the central role of ongoing student assessment. Volume one contains readings and professional development training activities that are organized into four chapters. It also features a CD-ROM that contains PowerPoint presentation slides for each chapter. Each chapter begins with an introduction that includes the goals for the chapter, outline of its content, and an index of the included professional development activities. In addition, every chapter includes readings and other handouts, a presenter's outline, and hard copies of the PowerPoint overheads. Chapter one begins with current thinking about standards-based instruction and the role of ongoing assessment of student skills and knowledge. It also examines the reasons that changes in assessment are taking place, discusses the purposes of assessment, and provides help with deciding when to use alternative assessments. Chapter two is designed to help participants understand the ways that assessments can affect and enhance instruction, and chapter three summarizes and analyzes current alternative assessment efforts. Samples from real assessment instruments are used to illustrate the points made during the discussion. The fourth chapter discusses the issues of why, whether, and how we should grade students; it also offers alternative ways to report student progress. In volume two of the toolkit, five appendices provide supplemental resource materials to be used in the training activities. Appendix A contains materials from 48 different assessment projects that include samples from all grade levels and several content areas: reading, writing, social studies, mathematics, and science. The other appendices provide samples of student responses to various performance tasks; papers and articles about grading and reporting; and sample training agendas, evaluation forms, and a glossary. (Author/LCT) ENC-016065


Improving Classroom Assessment
A Toolkit for Professional Developers
February 1998

Assessing Student Understanding

Science of Teaching Science Series

Grades K-12
1997
Author: producer, Ali Fahoodi; director, Kevin Lesniewicz

Ordering Information
Annenberg/Corporation for Public Broadcasting
PO Box 2345
South Burlington, VT 05407-2345
Fax: (802) 864-9846
Toll-free: (800) 965-7373
www.learner.org

$199.00 per series (8 tapes guide)
$24.95 per single video

Part of the Science of Teaching Science series, this video introduces methods to assess students in a constructivist classroom. Its purpose is to provide suggestions for professional development and discussions with practicing teachers and content experts about science and math teaching. Hosted by Terez Waldoch and content specialist Dr. Kathleen Fisher, a panel of practicing teachers investigates a variety of methods that can be used to assess students in diverse classrooms and still promote exploration. The featured teacher in this video, Jean Huff, demonstrates how she uses performance assessments and multi-sensory activities to help students with different abilities participate and excel. Video footage shows Huff's students doing a chemical analysis of mixed powders. Lab notebooks are found to be an effective means of evaluating the students' understanding, record keeping, and data analysis. Student performance in group activities can be assessed by allowing their groupmates to evaluate them. Writing assignments, such as Cinquain poems and creative stories, can encourage students to use descriptive language in science. Venn diagrams are used to help the students compare and contrast, while concept maps can identify misconceptions. Embedded assessments allow the teacher to see how the students are performing while they are learning the concept. During activities, teachers should move around to the different students so they can evaluate their progress. The panel also found it is valuable to get the students involved in their own evaluation. Finally, the panel discussed frameworks, emphasizing that they are not meant to be an add-on and listing their benefits and liabilities. (Author/JSR) ENC-013866

Professional Development Workshops

BEST COPY AVAILABLE

Learning About Assessment, Learning Through Assessment

Compass Series

Grades K-12
1998
Author: Mark Driscoll and Deborah Bryant

Ordering Information
National Academy Press
Lockbox 285
2101 Constitution Avenue NW
Washington, DC 20055
(202) 334-3313 / Fax: (202) 334-2451
Toll-free: (800) 624-6242
www.nap.edu/

$15.00 per book (paperback)

Standards: NCTM Professional Standards (1991)

The Compass series consists of three booklets that explore the implications of standards-based mathematics reform initiatives on curriculum, instruction, and assessment. In this particular booklet, readers will find perspectives on assessment-focused professional development. The text is based on recent staff development literature and the personal experiences of teachers. Its goal is to define professional development that can support teachers in becoming more effective users of assessment. The authors advocate that teachers' professional development in assessment be carried on with colleagues in groups that work together over time, rather than through a set of disconnected events. This position is consistent with the NCTM's *Professional Standards for Teaching Mathematics* (1991). The aim is to encourage teachers to explore assessment strategies as they focus their skills on gathering and using evidence to make valid inferences about student achievement. This group model is structured to address the varied underlying concerns that teachers have about the assessment process. Also found are suggestions for developing the expertise of lead teachers, aligning policies and practice, and communicating with the public. References are included. (Author/JRS) ENC-015965

JUMP ONLINE!

If you are interested in finding more resources that deal with assessment, you might try searching ENC's online database using words such as: assessment, rubrics, achievement, portfolios, grades, and questioning. Use quotation marks around word pairs such as "standards-based assessment," "standardized tests," "instructional issues," "performance tasks," and "professional development."

Mathematics Assessment, A Video Library, K-12

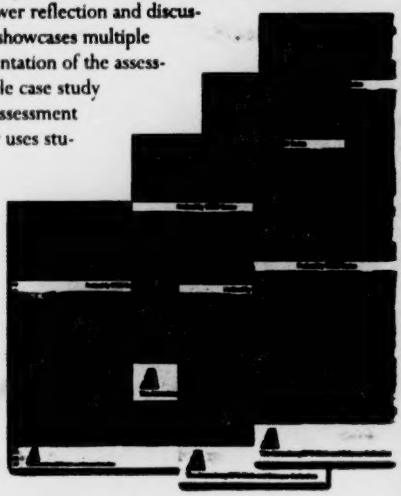
Grades K-12
1997
Author: producer, Robert Roche

Ordering Information
Annenberg/Corporation for Public
Broadcasting
PO Box 2345
South Burlington, VT 05407-2345
Fax: (802) 864-9846
Toll-free: (800) 965-7373
www.learner.org

$199.00 per complete library (5 videos + guidebook)
$125.00 per grade-level package (elementary, middle, or high)
$17.00 per guidebook

Standards: NCTM Assessment Standards (1995)

The K-12 case studies in this professional development video library illustrate a range of assessment approaches based on NCTM's *Assessment Standards for School Mathematics* (1995). The five videos and related guidebook are designed to prompt discussion and reflection about changing assessment practices and to help viewers see the link between instruction and assessment. Materials are designed for use in preservice and inservice teacher workshops, by individual teachers, in parent-teacher association meetings, and by school administrators. The first of the five videos is an introduction to acquaint viewers with the library and its components. Three case-study videos illustrate a variety of assessment strategies at the elementary, middle, and high school levels. The final video addresses the changing nature of assessment through discussions and interviews with teachers, administrators, parents, and policy makers. Each case-study video presents two case studies, analysis questions for viewer reflection and discussion, and a segment that showcases multiple examples of the implementation of the assessment standard. In a sample case study from the middle school assessment video, a Montana teacher uses student observations from a field trip to Yellowstone National Park to assess students' estimation skills and understanding of large numbers. After the class estimates the total number of bison, elk, and pronghorn antelope, groups of students use a park map and information on an assigned animal to revise the estimate for the population of that animal. Each group must present its estimate and reasoning to the class. Group estimates are placed on a number line, a process that reveals student knowledge of large numbers. A group's success is determined by the reasonableness of the estimate, the nature of the group interactions, and the quality of the group presentation. After this case study, a question for viewer discussion asks: How can peer assessment contribute to learning? The guidebook provides background on schools and classes featured in the videos, exploration activities, and discussion topics for workshops. (Author/JRS) ENC-014526



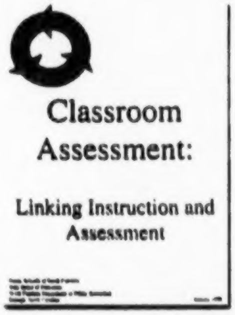
Classroom Assessment: Linking Instruction and Assessment

Grades K-12
1999
Author: Public Schools of North Carolina, State Board of Education, North Carolina Department of Public Instruction

Ordering Information
North Carolina Department of Education
North Carolina Department of Public Instruction
Publication Sales, Room B75
301 North Wilmington Street
Raleigh, NC 27601-2825
(919) 715-1018 / Fax: (919) 715-1021
Toll-free: (800) 663-1250
www.dpi.state.nc.us/

$6.00 per manual (paperback)
Order # LS 111
$3.00 per study guide
Order # LS 112

Developed to accompany *The Mathematics Assessment* video library described on the preceding page, these documents are designed to promote assessment literacy among K-12 educators in North Carolina. Another goal is to stimulate teachers to think further about how assessment can be used creatively to promote high levels of learning in the classroom. The manual begins with an overview that defines assessment and discusses its purposes in terms of accountability, program evaluation, instruction, and student placement. It also presents the assessment cycle model that links assessment methods with learning targets, decisions, and actions. Subsequent chapters explore assessment as a process of feedback and purpose, targets and methods, and uses and actions. The text also discusses five major assessment strategies: selected and written response, performance tasks, conversations, and observations. Guidelines are provided for clarifying learning goals, making instructional decisions, and communicating the results of assessment. The study guide contains learning objectives and activity sheets that review the material presented in the manual, as well as summaries of the videos. (Author/LCT) ENC-015792


Classroom Assessment:
Linking Instruction and Assessment

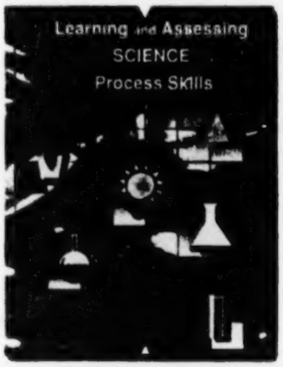
Learning and Assessing Science Process Skills

Grades K-8
1995
Author: Richard J. Rezba, Constance Stewart Sprague, Ronald L. Fiel, H. James Funk, James R. Okey, Harold H. Jaus

Ordering Information
Kendall/Hunt Publishing Company
4050 Westmark Drive
PO Box 1840
Dubuque, IA 52004-1840
Fax: (800) 772-9165
Toll-free: (800) 770-3544
www.kendallhunt.com

$30.95 per book (paperback)

Individuals and groups of teachers can use this book to learn how to develop necessary science knowledge and skills in their students. The authors identify science process skills as those things scientists do when they study and investigate, such as measuring, observing, and inferring. The goal is to make teachers feel competent and confident in scientific investigations and experimental design, so that they can better help students reap similar benefits. The first part of the book is devoted to basic science process skills, while the second describes integrated science process skills. Each chapter in the first half of the book includes a materials list, a justification for the exercise, goals, and performance objectives. These chapters also contain skill-building activities, a self assessment, and an example of how teachers can assess students in this skill. For example, a chapter about inferring includes an activity in which students are supposed to make an inference about the pattern of tracks in the snow as seen in a figure. They are told to make two observations about the patterns in each of three frames and then draw an inference from those observations. They can compare their work with someone else's or with the self-check list. The chapters in the second part of the book cover skills instead of activities. As an example, in a chapter on constructing a graph, students are instructed to plot data pairs as points on a graph. A suggested assessment involves students in collecting data about how the period of a pendulum changes as its length changes. The teacher then assesses the graphs drawn by the students to depict the data they generated. Decision-making chapters are included to enhance the readers' teaching of process skills. The book includes an appendix with materials and equipment that can be used for learning and assessing science process skills. (Author/JSR) ENC-014020


Learning and Assessing
SCIENCE
Process Skills

Performance-Based Curriculum for Science

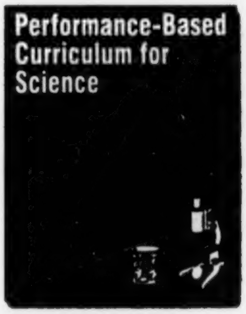
From Knowing to Showing Series

Grades K-12
1997
Author: Helen L. Burz, Kit Marshall

Ordering Information
Corwin Press, Inc.
2455 Teller Road
Thousand Oaks, CA 91320-2218
(805) 499-9774 / Fax: (800)417-2466
Email: order@corwinpress.com
www.corwinpress.com

$24.95 per book (paperback)

The framework provided in this book can be used for planning performance-based science that includes examples set in real-life contexts. The first of the book's four main sections uses a question-and-answer format to discuss performance-based learning actions and the rationale for using this method to teach science. The second section describes content standards and performance benchmarks for grades 3, 5, 8, and 12 in life, physical, and Earth sciences. The standards are organized by major strands within each discipline and include examples of exemplary student performances for each level of development. A sample performance task from the energy strand asks grade 3 students to walk around the school, observe and record things that move, and categorize them according to what caused their movement. Grade 5 students conduct a simple test to see how well different materials conduct heat, and grade 8 students investigate how the addition or removal of heat affects a system. For grade 12, students are asked to use Newton's laws to explain why people in a moving car lurch forward during a sudden stop. The third section, Technology Connections, discusses strategies that require students to access, produce, and disseminate information through technology. The last section, Performance Designers, provides a planning tool for teachers that focuses on the key elements of content, competence, content, and quality criteria. The appendix provides design templates and reproducible masters for teachers to use in creating their own classroom materials. Bibliographic references are also provided. (Author/LCT)
ENC-015652



Garnetta Chain; Assessment

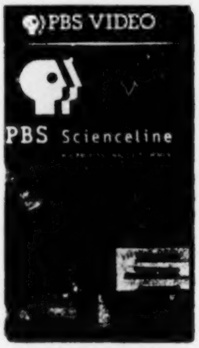
PBS Scienceline, K-5 Professional Development Series

Grades K-5
1998
Author: produced by Bob Morris and Pam Pooley; executive producer, Sandra

Ordering Information
Public Broadcasting Service
PBS Orders
1320 Braddock Place
Alexandria, VA 22314-1698
(703) 739-5071 / Fax: (703) 739-7513
Toll-free: (800) 645-4727
Email: shopeducation@pbs.org
www.pbs.org

$199.00 per set (6 tapes + guide)
Order # ESSP100-WEBSL
Note: Order under the title Scienceline K-5 Professional Development. This is one of the titles in the set.

In this video, teachers are shown in their classrooms modeling specific aspects of standards-based instruction. It is part of a series that uses the integration of video and online technologies to provide teachers with a forum in which they can get examples and ideas about how to implement the National Science Education Standards. This video contains two 30-minute segments. The first segment shows how a third-grade teacher uses guided inquiry methods to help her students understand how weathering changes rocks. The students perform experiments both inside and outside the school to see how water can cause erosion and smooth jagged edges on rocks. The teacher points out that the activities are messier and noisier than traditional science activities, but she feels the students learn more. The mess comes from the students actively interacting with the materials being studied, and the noise comes from their scientific discussion. She claims that students who have the most trouble in school reap the most benefits from the inquiry method. In the second segment of the video, all of the teachers highlighted in this series discuss how they assess their students' understanding and the achievements that have resulted from their inquiry investigations. Some of the strategies they employ are journals, portfolios, and self-assessment. Questioning techniques and performance assessments are also discussed. Teachers can discuss the topics covered in the videos with other teachers at the Scienceline web site, www.pbs.org/teachersource/scienceline/about/about.shtm. (Author/JSR)
ENC-015326



Exploring Classroom Assessment in Mathematics: A Guide for Professional Development

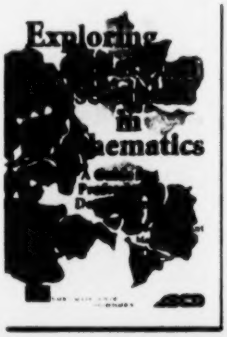
Grades K-12
1998
Author: Deborah Bryant and Mark Driscoll

Ordering Information
National Council of Teachers of Mathematics, Inc.
1906 Association Drive, Drawer A
Reston, VA 20191-1593
(703) 620-9840 / Fax: (703) 476-2970
Toll-free: (800) 235-7566
Email: orders@nctm.org
www.nctm.org

$12.50 per book (paperback)
Order # 672
Note: NCTM members receive a 20% discount.

Standards: NCTM Curriculum and Evaluation Standards (1989); NCTM Professional Standards (1991); NCTM Assessment Standards (1995)

This professional development guide was designed to help staff developers construct programs that are rooted in teachers' work. It details six professional development exercises, or teacher investigations, that help educators develop an organized way of generating and collecting adequate and relevant data about students' understanding. The underlying philosophy is that teacher development is grounded in student understanding. Each teacher investigation includes examples of mathematics activities for teachers to complete as they reflect on assessment of that understanding. Investigations include how to observe problem solving, examine students' work, and develop a rubric. This guidebook provides staff developers with tips for successfully facilitating a workshop on each of the professional development exercises. A list of resources is included. (Author/RMK) ENC-012663



Teacher Change: Improving K-12 Mathematics

change.enc.org

Grades K-12
Author: Eisenhower National Clearinghouse (ENC)

Standards: NCTM Curriculum and Evaluation Standards (1989); NCTM Professional Standards (1991)

The collection of materials at this site is intended to facilitate discussion, reading, reflection, learning, and change related to improving mathematics education. The materials include essays on teacher change, cases and stories about teaching practices in the US and other countries, professional development activities, PowerPoint presentations, and descriptions of curriculum materials that support changes in classroom practices. Data and resources from the Third International Mathematics and Science Study (TIMSS) are integrated throughout this project and provide the backdrop for the dialogue about change in mathematics classrooms. Some files require Adobe Acrobat Reader for viewing. The full text of the test items and performance assessments from TIMSS are included. (Author/GMM) ENC-014838

A Video Exploration of Classroom Assessment

Grades K-12
Author: interactive design and programming by Jason Marsh

Ordering Information
Institute for Research on Learning
66 Willow Place
Menlo Park, CA 94025
(650) 687-7949 / Fax: (650) 687-7957
www.irl.org

$39.95 per CD-ROM
(Windows/Macintosh)

Teachers can use this CD-ROM as a tool to facilitate reflection on their assessment ideas and experiences in small-group discussions as they improve, design, or experiment with assessment techniques. The program stresses the idea that teachers need to select or modify assessment techniques to meet their individual needs. It contains six case-study workshops with classroom video clips of middle school teacher Mona Muniz using peer reviews, notebooks, walk arounds, and tests to assess the students in her classroom. The program presents students' and other teachers' perspectives on the strengths and challenges of the methods modeled in Muniz's classroom. Also included is text that introduces and wraps up the workshop topics, along with questions that ask the teachers to reflect on their present assessment practices, analyze the practices modeled in the video, and experiment with making modifications in their own classrooms. Seven shorter discussion starters are included to stimulate conversations about subjects such as self-assessment and working with students who have limited English skills. Links to a related web site are embedded in the program; through these links, teachers can access articles, read other teachers' opinions, and post their own perspectives on the site. Text files are included on the disc that contain additional information about assessment design principles, peer review, and methods of grading and showing progress. Printable transcripts accompany the video clips, as well as student work and assessment forms. (Author/JR) ENC-016269

A Video Exploration of Classroom Assessment

PRACTICAL SKILLS FOR TEACHERS

Implementing multiple methods of assessment in your classroom is not easy. Even though we may be convinced that certain assessment strategies are worthwhile, the actual implementation is apt to prove difficult. Here we have listed some materials that may be helpful in getting you started, assisting you through the rough spots, and helping you recognize what can be improved. Some provide anecdotal classroom examples, some illustrate the design of specific assessment tools, and some may help you match assessment to student abilities.

Mathematics Assessment: A Practical Handbook for Grades 9-12

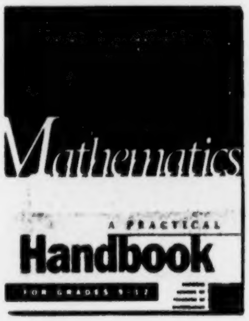
Classroom Assessment for School Mathematics Series

Grades 9-12
1999
Author: edited by William S. Bush, Anja S. Greer

Ordering Information
National Council of Teachers of Mathematics, Inc.
1906 Association Drive, Drawer A
Reston, VA 20191-1593
(703) 620-9840 / Fax: (703) 476-2970
Toll-free: (800) 235-7566
Email: orders@nctm.org
www.nctm.org

$19.95 per handbook (paperback)
Order # 720E1

Standards: NCTM Assessment Standards (1995)



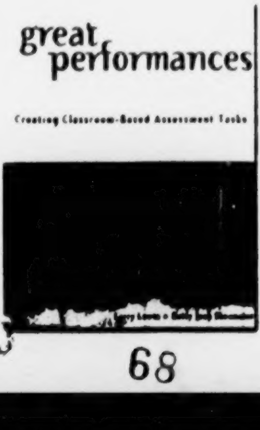
This book for high school teachers offers ways to create a coherent and open assessment process that enhances mathematics learning. It also covers how to promote equity and how to use assessment to make valid inferences about mathematics learning. It is one of six books created by an assessment task force to support the NCTM assessment standards of 1995. The series offers examples, reflections, explanations, and tips to help teachers explore the role of assessment in reshaping mathematics teaching and learning. The first chapter of this book describes reasons for considering new assessment methods and gives suggestions for aligning curriculum, instruction, and assessment. In the second chapter the focus is on how to find, modify, and create assessment tasks. An example is an open-ended task designed to learn what the student knows about mathematical modeling. The student reads an article about predictions of melanoma incidence and uses the information to develop a mathematical model. The task calls for the inclusion of documentation about how and why the student's model was developed. Included with this task are samples of student work that illustrate differences in approach, solution, and calculator and computer use. The remaining chapters offer ways to plan and conduct a coherent classroom assessment program. They also present ideas for scoring, grading, reporting, and using the collected data to make instructional decisions. Each chapter contains teacher support material, definitions of common terms, and examples of tasks, student work, rubrics, and strategies for scoring and grading. Illustrations, margin notes, and color are used to highlight concepts. Included are references to primary sources and to related materials in the series. (Author/JRS) ENC-015933

Great Performances: Creating Classroom-Based Assessment Tasks

Grades K-12
1998
Author: Larry Lewin, Betty Jean Shoemaker

Ordering Information
Association for Supervision and Curriculum Development
1703 North Beauregard Street
Alexandria, VA 22311-1714
(703) 578-9600 / Fax: (703) 575-5400
Toll-free: (800) 933-2723
Email: member@ascd.org
www.ascd.org

$17.95 per book (paperback)
Order # 198184
($14.95 ASCD member price)


great performances
Creating Classroom-Based Assessment Tasks
Larry Lewin • Betty Jean Shoemaker

Read what these authors have learned during their teaching experience about developing and effectively assessing student performance tasks. Performance assessment tasks are defined as orchestrated efforts to create situations for students to apply core conceptual understandings to strategic processes and thereby create personally meaningful new knowledge. In such tasks, evaluation criteria are clearly identified and the focus of evaluation is on both the product and the process used to produce it. The authors of this book see performance assessment as a powerful motivator when well-defined tasks are used to challenge students and result in greater student understanding. The book includes background on modes for acquiring content knowledge, such as reading, listening, manipulating, and viewing. It also develops assessment tasks that use a variety of output modes—graphic, written, oral, and constructions—for evaluation purposes. In a sample assessment task, grade 8 social studies students draft a technical training manual to help the fifteenth-century Spanish newcomers establish peaceful relationships with the Taino tribe, the Native Americans of the Caribbean. The goals of this assignment include discovering what students have learned about content and teaching them to compose technical writing materials. Students are given a list of content requirements, process requirements, and assessment standards on which the chapters will be scored. Examples of other assessment tasks include writing a historical persuasive letter, debating a relevant issue, and creating museum exhibits, models, and prototypes. The student projects and assessment tools in this book can be adapted for classroom use. The appendix includes a writing scoring guide and references. (Author/JRS) ENC-014237

A Collection of Performance Tasks and Rubrics: Primary School Mathematics

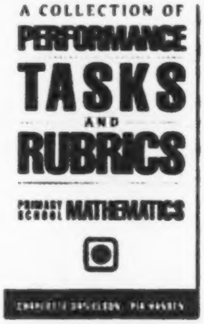
Grades K-3
1999
Author: Charlotte Danielson and Pia Hansen

Ordering Information
Eye On Education
6 Depot Way West
Larchmont, NY 10538
(914) 833-0551 / Fax: (914) 833-0761
Email: info@eyeoneducation.com
www.eyeoneducation.com

$24.95 per book (paperback)

Standards: NCTM Curriculum and Evaluation Standards (1989)

This book, part of a four-book collection that spans primary, upper elementary, middle, and high school level mathematics, features 24 classroom-ready mathematics performance tasks, each with a scoring guide, a listing of the mathematics standards assessed in the task, and a fully detailed solution. The series is designed to help teachers implement performance tasks to assess student achievement and progress as recommended by the NCTM standards. Each book also provides an overview of the rationale for the use of performance tasks in the classroom along with a description of a field-tested process for developing performance tasks and rubrics. One sample performance task from this volume gives the student the following scenario: Your aunt and uncle sent you a birthday card with a dollar for each year of your age; this year you are seven. Plan to spend the money buying as many books as possible with a book order. The student must budget to spend as close to seven dollars as he or she can without going over the limit; work is used to assess place value addition and subtraction skills. The scoring guide uses a four-level scale to evaluate the mathematical accuracy of the solution, the degree of organization in the approach, the clarity of the explanation, and the description of the thinking process. In the appendix are reproducible handouts for each of the tasks. (Author/JRS) ENC-015874


A COLLECTION OF
PERFORMANCE
TASKS
AND
RUBRICS
PRIMARY SCHOOL MATHEMATICS

A Collection of Performance Tasks and Rubrics: Upper Elementary School Mathematics

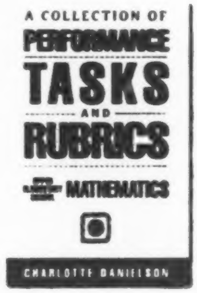
Grades 3-5
1997
Author: Charlotte Danielson

Ordering Information
Eye On Education
6 Depot Way West
Larchmont, NY 10538
(914) 833-0551 / Fax: (914) 833-0761
Email: info@eyeoneducation.com
www.eyeoneducation.com

$27.95 per book (paperback)

Standards: NCTM Curriculum and Evaluation Standards (1989)

Part of the series described above, this upper elementary school volume contains classroom-ready performance tasks. In one example, the student is given the following scenario: Your family is moving and your mother has asked you to buy enough tape to close 75 boxes of the same size. To solve this task, the student must apply an understanding of perimeter for a three-dimensional object and convert between yards and inches. The scoring guide for this task evaluates, on a four-level scale, the mathematical accuracy of the solution, the degree of organization in the approach, the clarity of the explanation, and the description of the thinking process. The book also provides practical advice for evaluating student work and establishing performance standards. Some tasks in each of the books include samples of student work, assigned scores, and explanations of how scores were determined. The appendix contains reproducible handouts for each of the 24 tasks. (Author/JRS) ENC-015693


A COLLECTION OF
PERFORMANCE
TASKS
AND
RUBRICS
MATHEMATICS
CHARLOTTE DANIELSON

A Collection of Performance Tasks and Rubrics: Middle School Mathematics

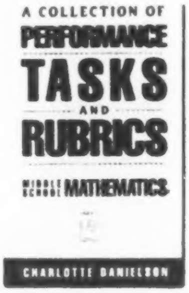
Grades 6-8
1997
Author: Charlotte Danielson

Ordering Information
Eye On Education
6 Depot Way West
Larchmont, NY 10538
(914) 833-0551 / Fax: (914) 833-0761
Email: info@eyeoneducation.com
www.eyeoneducation.com

$27.95 per book (paperback)

Standards: NCTM Curriculum and Evaluation Standards (1989)

Part of the series described above, this book for middle school teachers offers 24 classroom-ready mathematics performance tasks. Each task includes a scoring guide, a listing of the mathematics standards it assesses, and a fully detailed solution. In a sample task from this volume, the student is asked to bid for a contract to paint the walls of the mathematics classroom using two coats of paint. The assessment task requires the student to apply skills in measurement and calculation to this practical situation. The student must measure with a reasonable degree of accuracy and remember to exclude the doors and windows from the area measurement. Using a four-level scale, the rubric for this task evaluates the student's bid in terms of measurement skills, mathematical accuracy, general approach, and explanation of the process. The appendix contains reproducible handouts for each of the 24 tasks. (Author/JRS) ENC-015710


A COLLECTION OF
PERFORMANCE
TASKS
AND
RUBRICS
MIDDLE SCHOOL MATHEMATICS
CHARLOTTE DANIELSON

A Collection of Performance Tasks and Rubrics: High School Mathematics

Grades 9-12
1998
Author: Charlotte Danielson and Elizabeth Marquez

Ordering Information
Eye On Education
6 Depot Way West
Larchmont, NY 10538
(914) 833-0551 / Fax: (914) 833-0761
Email: info@eyeoneducation.com
www.eyeoneducation.com

$29.95 per book (paperback)

Standards: NCTM Curriculum and Evaluation Standards (1989)

High school teachers can use this book, part of the series described on the preceding page, to offer their students 20 classroom-ready mathematics performance tasks, each with a scoring guide, a listing of the mathematics standards assessed in the task, and a fully detailed solution. A sample performance task states that the student is four feet off the ground in the bottom car of a Ferris Wheel and ready to ride. Given that the radius of the wheel is 25 feet and it makes 2 revolutions per minute, the student is asked to find the height of the car from the ground after the first 45 seconds of a ride. The assessment task requires the student to sketch a graph showing distance versus time, describe the periodic nature of the relationship, find the speed at which the wheel is moving, and write an equation that describes the graph. Extending the task, the student analyzes the effect that decreasing the wheel radius has on period, amplitude, and speed. The rubric for this task evaluates the student's response in terms of graphing skills, mathematical knowledge as reflected in the answers to specific questions, accuracy of calculations, and explanation of the process. Reproducible handouts for all 20 tasks can be found in the appendix. (Author/JRS) ENC-016053

Portfolios in the Classroom: Tools for Learning and Instruction

Stenhouse In Practice Series

Grades K-8
1997
Author: Beth Schipper, Joanne Rossi

Ordering Information
Stenhouse Publishers
PO Box 1929
Columbus, OH 43216-1929
Fax: (614) 487-2272
Toll-free: (800) 988-9812

$12.50 per book (paperback)

In step-by-step detail, this book explains the process of creating student portfolios. The authors are former third-grade teachers who view portfolios as valuable tools for helping teachers refine their teaching to improve student learning. They describe the central value portfolios can have in developing a student's self-awareness, personal responsibility for learning, and active engagement in the learning process. Using examples from real portfolios and successful classroom experiences, the book illustrates how portfolios can be used to reveal accurate assessments of student work, to set goals for future learning, and to facilitate parental involvement. Included are reproducible forms for use in the portfolio process and a complete bibliography. (Author/JRS) ENC-015291

BETH SCHIPPER
JOANNE ROSSI

The Best of Math Exemplars

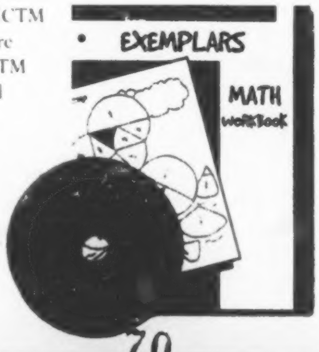
Grades K-8
1997
Author: Exemplars

Ordering Information
Exemplars
271 Poker Hill Road
Underhill, VT 05489
(802) 899-4409 / Fax: (802) 899-4825
Toll-free: (800) 450-4050
Email: exemplar@sover.net

$425.00 per CD-ROM package (Windows/Mac)
Order # BOMCD
Note: $210.00 for 2-9 schools; contact publisher for system requirements and site licensing information.

Standards: NCTM Curriculum and Evaluation Standards (1989)

Complete with teacher workbook, this CD-ROM contains a collection of 180 favorite tasks from the first four years of Math Exemplars, a monthly subscription series for math teachers in grades K-8. On the CD-ROM, each Exemplars task has been plotted on a matrix that shows its relationship to the NCTM standards of 1989. The tasks are searchable by grade level, NCTM standards, arithmetic skill, and interdisciplinary links. One hundred of these tasks are teacher-developed authentic assessment tasks with specific rubrics and annotated examples of student work at four levels of performance: novice, apprentice, practitioner, and expert. These examples serve as benchmarks for making scoring judgments. The remaining 80 tasks are for instruction and exploration and for preparing students for assessment. For each task, users are given the context for the activity, time required, teaching tips, and materials needed. Each task also indicates what is assessed and what the student is expected to do, along with interdisciplinary links. In a sample one-hour task for grades 3-5, students are asked to find a fair way for two people to share payment for two pairs of shoes at a buy-one-get-one-free sale. The accompanying teacher's workbook leads teachers on a step-by-step investigation of the CD-ROM to find materials appropriate for their classroom. (Author/JRS) ENC-013660



Secondary Exemplars

Grades 9-12
1996
Author: editor, Cornelis De Groot

Ordering Information
Exemplars
271 Poker Hill Road
Underhill, VT 05489
(802) 899-4409 / Fax: (802) 899-4825
Toll-free: (800) 450-4050
Email: exemplar@sover.net

$190.00 for Module 1 (Fall)
Order # HS1
$190.00 for Module 2 (Spring)
Order # HS2
Note: Macintosh required; contact publisher for system requirements.

Standards: NCTM Curriculum and Evaluation Standards (1989)

The two modules in this collection of teacher-developed materials, in both print and disk formats, feature an assortment of authentic assessment problems and scoring rubrics for high school math teachers. Each module contains five teacher-created tasks that are all linked to specific NCTM standards and to the arithmetic skills students would use to solve them. Provided for each task is the context of the task, what the task accomplishes, what the student is expected to do, time required, interdisciplinary links, teaching tips, and materials needed. Each problem includes a task-specific rubric describing four levels of performance: novice, apprentice, practitioner, and expert. There are annotated benchmark papers for each level that show, for example, what an apprentice might do on the particular task. Each task also includes an optional technology component. In a sample task, students must find the location of treasure found at the point of intersection of lines on a map. Possible problem-solving strategies include using the Pythagorean Theorem and proportions for an algebraic solution, making an accurate scale drawing, using Geometer's Sketchpad software, and using coordinate geometry to find the equations of the lines and point of intersection. Included are illustrated examples of student work to use as guidelines for teacher assessment. The two modules of Secondary Exemplars are offered to schools by subscription. (Author/JRS) ENC-011979

Making Problems, Creating Solutions: Challenging Young Mathematicians

Grades 1-6
1999
Author: Jill Ostrow; foreword by Allyn Snider

Ordering Information
Stenhouse Publishers
PO Box 1929
Columbus, OH 43216-1929
Fax: (614) 487-2272
Toll-free: (800) 988-9812

$19.50 per book (paperback)

Standards: NCTM Curriculum and Evaluation Standards (1989)

Written by a practicing teacher, this book introduces the notion of workshop learning in mathematics and demonstrates ways in which teachers can integrate mathematics into all curricular areas. The author shares her own experiences, illustrating a process approach to mathematics acquisition that is based on understanding, challenge, independence, confidence and choice. Students practice, collaborate, experiment, share, think, re-think, and confer with the teacher about the math problems on which they are working. This approach, the author feels, has encouraged her students to apply their growing knowledge to new problems and other areas of their lives. The book shows applications of the NCTM standards through classroom vignettes. In addition to the mathematics workshop, the author delineates the merits of embedded, problem-based, authentic assessment models over standardized test models. Examples of students' solutions and thinking strategies illustrate the book's points. The appendix coordinates each problem discussed in the text, along with an additional 33 problems, with the NCTM K-4 standards. (Author/GMM) ENC-015290

MAKING PROBLEMS, CREATING SOLUTIONS
Challenging Young Mathematicians
JILL OSTROW

TechPaths for Math

Grades K-8
1998
Author: user's guide by James M. Wilson III and Bena Kallick
Publisher: Technology Pathways Corporation

Ordering Information
Association for Supervision and Curriculum Development
1703 North Beauregard Street
Alexandria, VA 22311-1714
(703) 578-9600 / Fax: (703) 575-5400
Toll-free: (800) 933-2723
Email: member@ascd.org
www.ascd.org

$150.00 per CD-ROM package (Windows/Mac)
Order # 598238H01
Note: Lab packs available. Contact publisher for system requirements.

Standards: NCTM Curriculum and Evaluation Standards (1989)

The database on this CD-ROM includes more than 100 classroom-tested tasks to help K-8 teachers plan lessons and assessments and keep records of classroom activities. The CD-ROM includes four integrated software programs: a planner for classroom instruction and assessment; a database of assessment tasks, including sample student papers; a grader with a scoring system for student records; and a task designer with coaching assistance for the design of new tasks. The assessment tasks are based on the NCTM standards (1989) and are organized so that teachers can select a task according to developmental level, the standards to be tested, and the mathematical operations to be used by students. In a sample assessment activity for grades K-2, students work in groups to determine the number of trips it takes for a large Native American family to cross a river if only three people with food and supplies will fit into a canoe. This open-ended task involves problem solving with strategies such as drawing a picture, experimenting, and trial and error. Scoring rubrics are included. (Author/JRS) ENC-013659

Science and Writing Connections

Assessment Bookshelf Series

Grades 6-9
1999
Author: Robin Lee Harris Freedman

Ordering Information
Dale Seymour Publications
4350 Equity Drive
Columbus, OH 43228
Toll-free: (800) 321-3106
www.cuisenaire-dsp.com

$13.95 per book (paperback)

The writing activities and strategies in this book are designed to help educators teach and assess students' abilities to explore science issues, ideas, and concepts. Another purpose of the book is to advocate student-centered classrooms in which science is studied by asking questions, by investigating, and by making the content relevant to students. In these classrooms, students explore global issues that are relevant to many cultures and nationalities. The first chapter of the book introduces a four-step model for process writing: prewriting activities, composing a rough draft, peer review and revision, and publishing or sharing student work. This chapter also provides sample rubrics for scoring student work, information about portfolios, and suggestions for helping students differentiate between negative and constructive criticism. Subsequent chapters contain creative writing activities and other activities that allow students to express their understanding and to think and write at higher cognitive levels. The prewriting activities in chapter two, for example, use clustering, questioning, and focused free writing to elicit students' prior knowledge and to organize their ideas. Chapter three introduces the daybook as a strategy for helping students improve their science comprehension and to become more involved in their own learning. Sample activities guide students toward higher-level thinking processes such as concept mapping and open-ended essays; other activities provide creative options, such as comics, posters, and skits, that focus on learning styles other than verbal/linguistic. The final chapters contain activities to guide students through formal science writing based on independent research projects. Illustrated with sample writing prompts, rubrics, and student work, the book also features an appendix with blackline masters of handouts. The index lists the activities according to their sequence in the school year, time requirements, and collaborative grouping strategies as well as science processes and skills. Bibliographic references are provided. (Author/LCT) ENC-016064

Open-Ended Questioning: A Handbook for Educators

Assessment Bookshelf Series

Grades K-12
1994
Author: Robin Lee Harris Freedman

Ordering Information
Dale Seymour Publications
4350 Equity Drive
Columbus, OH 43228
Toll-free: (800) 321-3106
www.cuisenaire-dsp.com

$13.95 per book (paperback)

Part of the series described above, this book offers a simple method for writing open-ended questions and using them to assess student progress. The author describes open-ended questions as a form of authentic assessment that allows students to use higher-order thinking skills through a variety of writing styles. Open-ended questions usually consist of two parts: a prompt and the directions for writing. The prompt, which sets up the writing situation, may be a cartoon, map, graph, quote, or diagram. The directions for writing help the students focus on the topic and writing style. For example, chemistry students are given a scenario in which their family has set off on a camping trip to the Continental Divide. They are directed to write an informative paper in which they evaluate the statement that water boils faster at higher elevations. In the second chapter is a five-step approach to writing open-ended questions. This approach begins with examining the curriculum for topics that lend themselves to open-ended questioning and choosing a questioning format based upon specific critical thinking skills, such as interpreting data or forming conclusions based on previous work. The other steps describe how to write a prompt, provide directions for writing, and include a simple scoring rubric. Chapter three describes six questioning formats that range from description and comparison to analysis, problem solving, fiction, and evaluation. In the fourth chapter readers will find sample rubrics for each of the questioning formats, and chapter five contains suggestions for guiding students through the writing process. The remaining chapters provide additional examples of questions and rubrics for mathematics, physical sciences, chemistry, history, social studies, and language arts. The book is illustrated with sample rubric forms. Bibliographic references are provided. (Author/LCT) ENC-016039

Open-ended Questioning

Error Patterns in Computation

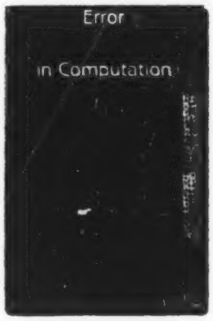
Grades 1-9
1998
Author: Robert B. Ashlock

Ordering Information
Prentice Hall
School Division Orders
4350 Equity Drive
PO Box 2649
Columbus, OH 43216-2649
Fax: (614) 771-7361
Toll-free: (800) 848-9500

$18.00 per book (with K-12 school discount—$33.95 retail)

Standards: NCTM Curriculum and Evaluation Standards (1989)

In this resource book, preservice and inservice teachers will find information on how to identify typical error patterns. The book provides insight into why a child may adopt an incorrect procedure and offers strategies for helping students learn the correct procedures. Part one focuses on assessment of error patterns and instruction in computation skills. In part two the emphasis is on particular mathematical topics, such as addition and subtraction of whole numbers. In each chapter, sample student papers are analyzed to identify errors and strategies are developed to help students correct specific error patterns. The book describes two major causes of error patterns: overgeneralizing and overspecializing. An example of overgeneralizing would be to assume that the longest side of every triangle is the hypotenuse and that, therefore, the Pythagorean Theorem applies even when the triangle is not a right triangle. Overspecializing occurs, for example, when a student decides that there needs to be the same number of digits on each side of the decimal point and that zeros may be added on either side of the decimal point in decimal addition. Error patterns are discussed within a problem-solving context. The book focuses on instructional strategies, such as talking math, writing math, using graphic organizers, and establishing portfolios to assist with the teaching of computation. There are selected references for assessment, diagnosis, and instruction. The appendices include additional student papers with error pattern keys, a discussion of research on errors in computation, and sample activities for cooperative student groups focusing on correct computational procedure. (Author/JRS) ENC-012181



Assessment Techniques

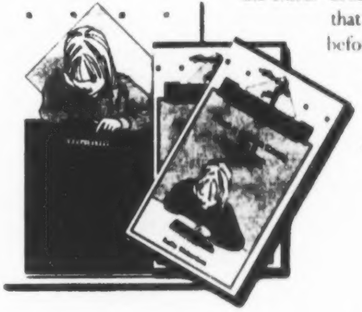
Look at Children's Thinking Series

Grades K-2
1990
Author: Kathy Richardson, illustrator, Jeannie Brunnick
Publisher: Educational Enrichment Inc.

Ordering Information
Educational Software Institute
770 West Rock Creek Road
PO Box 1524
Norman, OK 73070
(405) 321-3275 / Fax: (800) 292-8846
Toll-free: (800) 292-6022
Email: sheryl@telepath.com

$155.00 per set (2 videos + study guide)
Order # 3414V

Teachers of kindergaren through grade 2 can use these two videos as a model for assessment techniques to explore children's thinking and to discover their level of understanding of number concepts. The videos are based on the belief that understanding children's thinking enables teachers to provide the kinds of experiences students need in order to make sense of numbers and build a solid foundation for future success in mathematics. The footage shows the varying developmental levels in children's thinking and their understanding of number concepts such as counting and comparing numbers, number combinations, and place value concepts. Individual, small-group, and whole-class assessment sequences are included. In a sample assessment, individual students are presented with 20 to 25 UNIFIX cubes and asked to first guess and then check to see how many cubes are in the pile. This assessment explores the student's ability to estimate large numbers and his or her use of one-to-one correspondence when counting. The teacher modifies the task by adding or removing a cube to observe the student's use of counting on/counting back, while also observing the student's level of mathematical confidence and consistency of responses. Accompanying the videos is a study guide that provides an edited transcription of the video conversations, background information, answers to frequently asked questions, and questions for group discussion. Questions for discussion from the study guide include What have you learned about the child? What does the child know or not know? What else would you like to find out if you could ask more questions of the child? Breaks for discussion are included on the video so that viewers may answer the discussion questions before hearing the author's answers. The appendix to the study guide includes background information and a summary of the assessment questions that can be duplicated as viewer handouts. (Author/LDR/JRS) ENC-005982



Balanced Assessment for the Mathematics Curriculum, Middle Grades, Assessment Package 1

Balanced Assessment for the Mathematics Curriculum Series

Grades 6-9
1999
Author: editor, Mary Bouck

Ordering Information
Dale Seymour Publications
4350 Equity Drive
Columbus, OH 43228
Toll-free: (800) 321-3106
www.cuisenaire-dsp.com

$37.40 per book (paperback)
Order # GA33003

Standards: NCTM Curriculum and Evaluation Standards (1989)

This collection of 14 classroom-tested performance tasks is designed for students in grades 6-9. The book is part of the Balanced Assessment for Mathematics Curriculum Series, which was partially funded by the National Science Foundation and consists of two volumes of mathematical tasks for each level: elementary, middle, high school, and advanced high school. The series gives specific guidance on how to use the assessment tasks, examples of typical student work, and rubrics and commentary to help in evaluation. In this book, the tasks range in length from 15 to 180 minutes and consist of either a single problem or a sequence of problems covering topics such as estimation and measurement, functional relationships, and spatial representation in a problem-solving format. Each task begins with a teacher overview page that offers a task description, assumed student mathematical background, the mathematical ideas and processes central to the task, and classroom organizational information. Reproducible student pages present the prompt for beginning the task and questions outlining issues related to the task. In a sample 45-minute task, students must organize a round-robin table tennis competition. The class first determines the number of matches involved in a three-person tournament. Then, working individually, each student finds the number of matches in a competition with 10 people and four tables; the shortest amount of time for this competition if each match lasts 30 minutes; and how two additional people would extend the length of the tournament. In an open-ended, 180-minute task, students work in small groups to develop the rules for a game involving dropping a parachute on a target. Students collect, organize, and interpret data on game outcomes and formulate a group final report in which they identify three issues that require further investigation. A glossary of terms related to performance assessment is included. (Author/JRS) ENC-016267

Balanced Assessment for the Mathematics Curriculum, Middle Grades, Assessment Package 2

Balanced Assessment for the Mathematics Curriculum Series

Grades 6-9
2000
Author: editor, Mary Bouck

Ordering Information
Dale Seymour Publications
4350 Equity Drive
Columbus, OH 43228
Toll-free: (800) 321-3106
www.cuisenaire-dsp.com
$37.40 per book (paperback)
Order # GA33004

Standards: NCTM Curriculum and Evaluation Standards (1989)

Part of the series described above, this book offers 18 classroom-tested performance tasks that range in length from five to 45 minutes. In a sample 15-minute assessment task, each student organizes and graphs data about the number of pets owned by members of the Vet Club. The student must choose a measure of central tendency to characterize the data and justify the choice. In an example of a 45-minute task, pairs of students discuss five questions related to the determination of the actual length of a shopping cart from a scale drawing. Students work individually, using ratio and proportion, to determine how long a nested set of 20 shopping carts would be and then develop a rule or formula to use to find the length of a row of real nested carts for any number of carts. In a final activity, each student writes an explanation of his or her answers and creates a diagram with each part of the formula labeled. As with the book described above, this volume contains a glossary of performance assessment terms. (Author/JRS) ENC-016268

MIDDLE GRADES

Searching ENC

When you go online to learn more about the materials highlighted here and others, you will find more than one option for searching through ENC's vast collection. Here are a few general tips for making best use of ENC's database of teaching resources.

- The simplest search for curriculum resources on ENC Online allows you to type in any word, and select cost and grade level. Links at this search provide assistance in choosing words.
- The more advanced search options allow you to construct even more specific searches—this is great if you have very clear requirements in mind.
- The materials in this section were carefully selected by ENC's content specialists to fit the theme of this issue. If you would like to see more materials on this topic from ENC's collection, you can create your own search. Hint: To do our initial searches, we used terms such as
  "standards-based assessment"
  "performance tasks"
  "standardized tests"
  (Be sure to include quotation marks around search words.)
- The catalog records printed in this part of the magazine contain just the highlights of the full catalog record. To go directly to a specific record, type in the ENC number in the search window of any search option. It is important to type the ENC number exactly as it appears at the end of the item's abstract in this magazine.

CURRICULUM PACKAGES WITH A STRONG ASSESSMENT COMPONENT: MATHEMATICS

In this section we give examples of how alignment between instruction and assessment could look in the day-to-day curriculum. We want to re-emphasize that this list is not comprehensive. These are only samples, highlighted here to give an idea of what is presently available to schools.

Puddle Questions: Assessing Mathematical Thinking, Grade 5

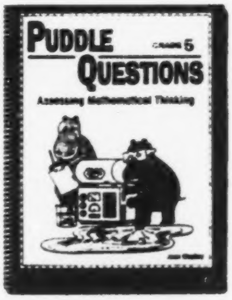
Puddle Questions: Math Series

Grade 5
1994
Author: Joan Westley; writers, Susan Greer, Nancy Tune

Ordering Information
Creative Publications
5623 West 115th Street
Alsip, IL 60803
Fax: (800) 624-0821
Toll-free: (800) 624-0822
www.creativepublications.com

$147.95 per series (grades 1-6)
Order # 80489-0201
Note: $25.95 per individual book

This resource book offers open-ended activities designed to assess how students think, use tools, execute ideas, and communicate mathematically. These investigations focus on statistics, probability, measurement, and estimation. Additional topics include reasoning, arithmetic, geometry, math language, and visual thinking. Sections on authentic assessment techniques and detailed teacher support allow the instructor to prepare, implement, and evaluate alternative performance assessments. Holistic scoring rubrics are given for each exercise. The book also includes follow-up activities to extend teachers' and students' learning. Reproducible blackline masters are provided in English and Spanish. Additional resources include record keeping and observation forms and a bibliography of supplementary resources. (Author/DDD) ENC-001506



Number Power, Grade 3

Number Power Series

Grade 3
1999
Author: Laurel Robertson, Shaila Regan, Marji Freeman, Julie Wellington Contestable, Susie Alldredge, Carol Tensing Westrich

Ordering Information
Developmental Studies Center
Publications Dept
2000 Embarcadero, Suite 305
Oakland, CA 94606-5300
(510) 533-0213 / Fax: (510) 464-3670
Toll-free: (800) 666-7270
Email: info@devstu.org

$19.95 per book (paperback)
Order # NPT031 for vol. 1, # NPT032 for vol. 2

The Number Power program provides replacement units that support students' mathematical and social development. This grade 3 set consists of two resource books that provide six multi-week units on topics such as place value, mental computation, visualization, and data analysis. These units are designed to help students examine how to take responsibility for their learning and behavior and to analyze how their behavior affects their group work. In a sample lesson, pairs of students create a fantasy pet by combining features from three different kinds of pets. Students draw pictures of their pets and develop a list of each pet's statistics and special abilities using data collected in a previous lesson. The student pairs then share their fantasy pet drawings and statistics with the class. The teacher resource books contain complete directions for the activities, along with open-ended discussion questions, ideas for lesson extensions, and informal assessment strategies. Blackline masters for activities, transparencies, and record sheets are included. This program was designated as Promising by the Math and Science Expert Panel of the US Dept. of Education. (Author/JRS) ENC-015276

Designing Spaces: Visualizing, Planning, and Building

Seeing and Thinking Mathematically in the Middle Grades Series

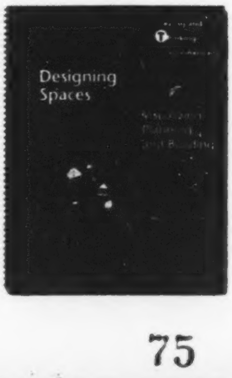
Grades 6 and 7
1995
Author: Education Development Center, Inc.

Ordering Information
Greenwood/Heinemann Educational Books Inc
88 Post Road West
PO Box 5007
Westport, CT 06881-5007
(603) 431-7894 / Fax: (800) 203-1502
Toll-free: (800) 225-5800
Email: custserv@heinemann.com
www.greenwood.com

$39.50 per book

Standards: NCTM Curriculum and Evaluation Standards (1989)

With this book, students can learn to use geometry to analyze buildings from around the world, to design their own house models, and to create plans for their designs. The philosophy of the series is that students' ability to complete such tasks is strengthened by activities that help them develop spatial visualization skills and increase mathematical vocabulary. Students learn mathematics by using and connecting mathematical ideas and by actively constructing their own understandings. In each unit, students explore mathematical ideas using physical and pictorial models; they then apply these ideas in investigations and projects. Students pose their own problems, create their own strategies, and build on their own knowledge and language. They also reflect on their work by discussing and writing about it. Each unit provides resources a teacher can adapt to suit his or her classroom and teaching style. The lesson plans suggest variations and extensions and include vignettes from teachers who taught the unit. Embedded in the activities are performance assessment alternatives such as global scoring rubrics, portfolios, and student journals. These units can be connected to the subject areas of art, literature, history, science, and social studies by using mathematics to analyze, decide, plan, design, and create. Each unit is summarized at the beginning by grade level, length, prerequisites, mathematical themes, and specific mathematics concepts. Also provided are scoring rubrics, sample final projects, templates, and blackline masters. (Author/LDR) ENC-005746



Survey Questions and Secret Rules: Collecting and Sorting Data

Investigations in Number, Data, and Space Series

Grade 1
1998
Author: Tracey Wright, Jan Mokros
Publisher: Dale Seymour Publications

Ordering Information
Scott Foresman Addison Wesley
School Services- Orders
PO Box 2649
4350 Equity Drive
Columbus, OH 43228
(781) 944-3700 / Fax: (800) 333-3328
Toll-free: (800) 552-2259

$25.25 per teacher's guide

First-grade students can use this book to focus on understanding, categorizing, and representing data. The book is part of a complete K-5 mathematics curriculum designed to offer students meaningful mathematical problems that emphasize depth in mathematical thinking rather than superficial exposure to a series of fragmented topics. In contrast with the usual textbook-based program, the Investigations curriculum is presented through a series of teacher books, one for each unit of study. Reproducible resources for students are provided, but the curriculum does not include student books. Students work actively with objects in their own environment and with a variety of manipulative materials and technology, rather than with workbooks and worksheets. This book contains four investigations, each of which comprises three to six sessions. Activities include pair- and small-group work, individual tasks, and whole-class discussions. The opening pages of each investigation present a synopsis of each session, an overview of the most important mathematical ideas that students will encounter, and a list of materials to gather. A sample investigation, Birthdays, emphasizes becoming familiar with calendar features as well as grouping, describing, and ordering data about birthdays. In session one, students use calendars to make cards showing their birth dates, then group themselves according to birth month. In session two, pairs of students try different ways of organizing the class birthday data. The third session involves students in listening to a month-by-month story and then creating a group timeline to tell a similar story over one year. At the end of each activity are recommendations for homework assignments and for follow-up activities. Embedded assessment activities are recommended throughout each investigation. These assessments can involve writing and reflecting, a brief interaction between student and teacher, or the creation and explanation of a product. Portfolio and observational assessments are also recommended on an ongoing basis. (Author/CMS/KFR) ENC-010481

Survey Questions and Secret Rules
1

Thinking with Mathematical Models: Representing Relationships

Connected Mathematics Series: Algebra

Grade 8
1998
Author: Glenda Lappan, James T. Fey, William M. Fitzgerald, Susan N Friel, Elizabeth Difanis Phillips
Publisher: Dale Seymour Publications

Ordering Information
Scott Foresman Addison Wesley
School Services- Orders
PO Box 2649
4350 Equity Drive
Columbus, OH 43228
(781) 944-3700 / Fax: (800) 333-3328
Toll-free: (800) 552-2259

$6.55 per student book
$18.15 per teacher's guide

Standards: NCTM Curriculum and Evaluation Standards (1989); NCTM Professional Standards (1991)

This student text and teacher's guide, one of eight units for grade 8, focus on constructing mathematical models, both algebraic and graphic. The series, supported by the National Science Foundation, is a complete middle school mathematics curriculum that emphasizes connections among the core ideas of mathematics. It also stresses connections between mathematics and other subjects, among classroom activities and student interests, and to applications to the outside world. Each unit contains investigations that support problem-centered teaching and break instruction into three phases: launch, explore, and summarize. The developers believe this instructional model encourages higher-level thinking, problem solving, and making sense of mathematics and its uses. In this unit, students use data from experiments with paper bridges and teeter-totters as they learn to use graph and equation models to represent trends in data. In one investigation, for example, students read a story about a bus trip gone awry and analyze graphs representing different aspects of the trip. They also create stories that interpret events modeled graphically. In other activities, graphing calculators are used to graph quadratic equations. In a mathematical reflection for the unit, students look at relationships associated with real-life situations that can be represented by graph and equation models. The teacher's guide explains the mathematics a teacher needs to understand in order to teach the unit along with lesson plans, blackline masters, and suggestions for using embedded assessment, journals, portfolios, and testing materials. Connected Mathematics is compatible with the criteria for teaching and learning mathematics described by the NCTM professional standards and evaluation standards. This program was designated as Exemplary by the Math and Science Expert Panel of the US Dept. of Education. (Author/JRS) ENC-011888

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Contemporary Mathematics in Context, Course 2

Core-Plus Mathematics Project Series

Grades 10-12
1998
Author: Arthur F. Coxford, James T. Fey, Christian R. Hirsch, Harold L. Schoen, Gail Burrill, Eric W. Hart, Ann E. Watkins

Ordering Information
Everyday Learning Corporation
PO Box 812960
Chicago, IL 60681-9906
(312) 540-0210 / Fax: (312) 540-5848
Toll-free: (800) 382-7670
www.everydaylearning.com

$185.00 per teacher resource package
Order # 39496
Note: Individual components available separately. Contact publisher for details and for computer equipment specifications.

Standards: NCTM Curriculum and Evaluation Standards (1989); NCTM Professional Standards (1991)

The second course in the Core-Plus Mathematics Project (CPMP) features real-world situations and problems involving data, shape, change, and chance. CPMP is a multi-year project supported by the National Science Foundation to develop a complete, integrated four-year high school mathematics curriculum that builds on the theme of mathematics as sense-making. The curriculum is designed to actively engage students in investigating and making sense of problem situations. Students also construct important mathematical concepts and methods and communicate their thinking and results. There is a four-phase cycle of classroom activities: launch, explore, share and summarize, and apply. In the materials for Course Two, which consists of student and teacher texts plus supplements, topics include the application of matrix modeling to inventory control and ecosystems; the use of statistical correlations and variability predictions; and the construction of probability distributions using simulation and mathematical analysis. Also covered is the investigation of trigonometric functions, angular velocity, and periodic change. Assessment opportunities are found in each phase of instruction. An Assessment Resources booklet contains quizzes, exams, and projects, while the Implementing the Core-Plus Curriculum booklet suggests journal prompts and ideas for portfolios. Each year ends with a capstone project. For the Course Two capstone, students plan a thematic two-week activity centered around forests and the environment and designed to pull together and apply the important modeling concepts and methods developed during the year. This course correlates its curriculum with the NCTM evaluation and professional standards. This program was designated as Exemplary by the Math and Science Expert Panel of the US Dept. of Education. (Author/JRS) ENC-012767

College Preparatory Mathematics 4 (Math analysis)

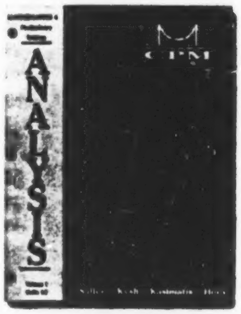
College Preparatory Mathematics: Change from Within Series

Grades 11 and 12
1999
Author: editors, John Cooper, Carmel Draper, Lill Birdsall

Ordering Information
College Preparatory Mathematics Educational Program
1233 Noonan Drive
Sacramento, CA 95822-2569
(916) 446-9936 / Fax: (916) 444-5263
www.cpm.org

$25.00 per student text set (2 vol.; paperback)
$45.00 per teacher's edition (loose-leaf)
Note: Materials are only available to those who have participated in the training workshop. The price of the workshop varies with location. For more information contact Chris Mikles at (888) 808-4276.

This analysis course is the final course in the College Preparatory Mathematics (CPM) high school curriculum program. It is designed to help students develop algebraic fluency and accuracy and to acquire an intuitive understanding of calculus concepts. The course involves more whole-class activities with teacher direction than previous CPM courses had and is designed to prepare the student for college-level mathematics. According to the authors, topic selection reflects the impact of graphing calculators on what students need to learn and on how discovery and exploration can be used to teach mathematics. A special feature of this course is that students are given instructions on specific calculator commands that are useful for certain problems. The entire four-year curriculum program, created by university professors and teachers, emphasizes conceptual understanding and problem-solving skills, with units developed around real-life themes. Based on the belief that concept mastery requires time, the program presents spiraled practice of the main course concepts throughout the year and emphasizes supportive group work for students. In a sample lesson from a modeling and trigonometry chapter, students use real-world scenarios to develop trigonometric functions that describe phenomena such as an ocean wave pattern, the revolution of a bicycle wheel, and the amount of air in a person's lungs. Students work in groups to develop their model and present their findings to the class. For each lesson, the teacher's edition includes a detailed explanation of the mathematics involved and suggestions for classroom organization. Also found are ideas for establishing and using cooperative learning groups, assessment materials including group test questions, a parent's guide, and solutions to all problems. This program was designated as Exemplary by the Math and Science Expert Panel of the US Dept. of Education. (Author/JRS) ENC-015635



CURRICULUM PACKAGES WITH A STRONG ASSESSMENT COMPONENT: SCIENCE

Puddle Questions for Science: Performance Assessment Investigations, Grade 6

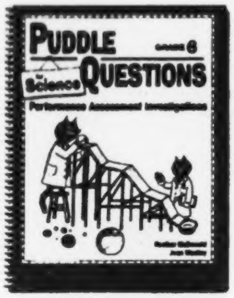
Puddle Questions: Science Series

Grade 6
1995
Author: Heather McDonald, Joan Westley

Ordering Information
Creative Publications
5623 West 115th Street
Alsip, IL 60803
Fax: (800) 624-0821
Toll-free: (800) 624-0822
www.creativepublications.com

$123.75 per series (grades 2-6)
Order # 31388-0201
$25.95 per book
Order # 31387-0201

The open-ended activities in this series of performance assessment books are designed to assess how students work through a complex investigation. The activities focus on science processes such as making careful observations, gathering data, conducting research, designing experiments, and interpreting results. This particular book, intended for sixth grade, includes topics from life, Earth, and physical sciences. Included are sections on authentic assessment techniques and detailed teacher support that describes how the instructor can prepare, implement, and evaluate alternative performance assessments. Holistic scoring rubrics are given for each investigation. Also included are follow-up activities, reproducible student sheets in English and Spanish, and record-keeping and observation forms. (Author/RA) ENC-003330



Insights & Outcomes: Assessments for Great Explorations in Math and Science

GEMS Series

Grades Pre-K-10
1995
Author: Jacqueline Barber, Lincoln Bergman, Jan M. Goodman, Kimi Hosoume, Linda Lipner, Cary Sneider, and Laura Tucker

Ordering Information
GEMS
Lawrence Hall of Science #5200
Berkeley, CA 94720-5200
(510) 642-7771 / Fax: (510) 643-0309
www.lhs.berkeley.edu/

$31.50 per book

Developed at UC Berkeley's Lawrence Hall of Science for the Great Explorations in Mathematics and Science (GEMS) program, this book provides a source of ready-made assessments and support for the creation of new outcomes and assessments for K-10 activity-based science and math programs. These assessment task models have been created with the goal of measuring the development of thinking skills, the meaningful construction and application of concepts, and the ability to pursue questions, solve problems, and communicate. The book includes a guide to effective assessment, ready-made assessment tasks, and 13 different assessment strategies. One section of the book details learning outcomes for each of the current GEMS teacher's guides, such as the Acid Rain guide (ENC-002675). Among the different assessment strategies are explorations in which students demonstrate skill development. Some applications require students to use their recently acquired concepts and skills in new or real-life situations. Additional assessments take the format of advertisements in which students pull together facts and ideas to communicate, evaluate and compare. Also provided are time-efficient strategies for teacher observations. (Author/GMM) ENC-006463

Investigating the Changing Earth

BSCS Science T.R.A.C.S. Series

Grade 4
1999
Author: Nancy M. Landes, Gail C. Foster, Colleen K. Steurer

Ordering Information
Kendall/Hunt Publishing Company
4050 Westmark Drive
PO Box 1840
Dubuque, IA 52004-1840
Fax: (800) 772-9165
Toll-free: (800) 770-3544
www.kendallhunt.com

$11.99 per student book (paperback)
$39.99 per teacher's edition (paperback)

Standards: Benchmarks for Science Literacy; National Science Education Standards (December 1995)

The nine lessons in this teacher's guide and student book introduce students to the concepts of weathering and erosion. The books are part of the Biological Sciences Curriculum Study (BSCS) Teaching Relevant Activities for Concepts and Skills (T.R.A.C.S.) series, designed to provide elementary students and teachers with developmentally appropriate activities in which students actively develop concepts, inquiry skills, and problem-solving skills in authentic science and technology situations. The science concepts are defined by the National Science Education Standards and the American Association for the Advancement of Science (AAAS) Benchmarks. Within each module teachers can find lesson plans, assessment strategies, and a structure for collaborative learning. They will also find an instructional model that connects learning experiences and background content information. Tables outline the materials needed, outcomes, and assessment indicators for each of the lessons. In one of this module's lessons, students discuss why the surface of the Earth is not flat if erosion is continuously taking place. An essay about Mount St. Helens acts as a springboard to a discussion about the changes in the Earth that a volcano causes. The students use a hard-boiled egg to model plate tectonics and the layers inside the Earth. A four-page biography of John Wesley Powell describes his adventures in the Grand Canyon and his theory about the canyon's formation. The student book has directions, background information, and black-and-white photographs that help students see both other students in school and adults on the job using the process skills employed in the module. The teacher's guide contains blackline handout masters and a list of additional related resources. (Author/JSR) ENC-014806

Change Over Time

Life Lab Science Series

Grade 5
1994
Author: writer, Leslie Comnes; curriculum director, Roberta Jaffe

Ordering Information
Videodiscovery, Inc.
1700 Westlake Avenue North, Suite 600
Seattle, WA 98109-3012
(206) 285-5400 / Fax: (206) 285-9245
Toll-free: (800) 548-3472

$45.00 per teacher's resource guide
$195.00 per set of 8 student lab modules
$315.00 per laserdisc set (laserdisk + image directory)
Note: Contact publisher for additional ordering options.

Life Lab is an interdisciplinary program of life, Earth, and physical sciences in which students learn science concepts by building tools, testing ideas, and watching changes in the world around them. A class garden and hands-on activities form the core of the program, encouraging students to cooperatively investigate life cycles, weather, animals, habitats, and more. For the grade 5 curriculum, the unifying theme is change over time. The year starts with students inferring simple changes in their own lives and in their garden. As students continue to explore changes, the concept of adaptation is introduced, which is a prelude to the underlying theme of evolution. By analyzing patterns of change, students are able to describe events and predict what may happen next. The curriculum is divided into eight units that are separately packaged as modules to increase the flexibility of use. Each of the eight modules is divided into a teacher's resource section and a student's lab book section. The teacher's resource section includes a unit planner and a list of student goals that summarizes the theme, skills, and concepts developed for the unit. The resource section also includes the words and score to an ecologically oriented song, an activity chart, an annotated bibliography of story and reference books, blackline masters, and an assessment checklist. For each activity, the resource section includes a key learning goal, background information, suggestions for integrating the activity into the curriculum, and process skills used in the activity. Also included are pre- and post-activity assessment strategies, extension ideas, and teacher reflection questions. The student lab book section includes pre- and post-activity assessment lab sheets that allow students to diagnose their own learning. This section also features lab handouts, unit calendars for students to use as a recording and observation tool, field log sheets, and engaging stories related to each unit's concepts. A separate teacher's guide describes the entire Life Lab program as well as the instructional and learning strategies that support the program. (Author/KSR) ENC-001468

DASH, Grade 3

DASH Series

Grade 3
1993
Author: principal authors, Francis M Pottenger III and Carol Ann Brennan

Ordering Information
University of Hawaii
Curriculum Research and
Development Group
1776 University Avenue
CMH Rm120
Honolulu, HI 96822
(808) 956-7863 / Fax: (808) 956-9486
Toll-free: (800) 799-8111
Email: crdg@hawaii.edu

$350.00 per set
Note: Includes support and blackline masters.

Developmental Approaches in Science and Health (DASH) is a sequential K-6 program that integrates science, health, and technology. In DASH, children discover the workings of science through practical, hands-on experiences that are designed to promote children's mental and physical development. The curriculum is constructivist based, uses concept maps extensively, and involves students in self-evaluation. The program advocates that teachers use portfolio-based judgment of student progress. In addition, DASH builds on cooperative learning and has a strong environmental component. The curricula for all grades have the same 10 strands: general learning; time, weather, and the sky; animals; plants; food and nutrition; health and safety; wayfinding and transportation; energy and communication; conservation, recycling, and decomposition; and matter, space, and construction. The teacher's guide provides a range of four to 21 activities per strand; each activity builds on those from the previous year and is appropriate for each specific grade level. For each activity, the developers indicate objectives, background information, a materials list, and the procedure. Each activity also indicates the role students should play, expected student products, and possible extensions. A second manual includes the handouts for the activities, a suggested year-long activity schedule, a scope and sequence of activities for the entire DASH program, and a comprehensive materials list for the grade 3 program. An instructional guide is available for the entire program. (Author/KSR) ENC-001232

BEST COPY AVAILABLE

There Is No Away

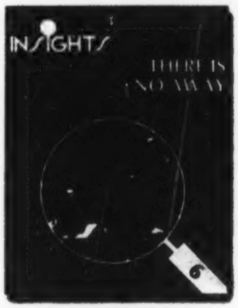
INSIGHTS Elementary Science Curriculum

Grade 6
1997
Author: Arlene Nichols, Charles Roth; editor, Roberta Winston

Ordering Information
Kendall/Hunt Publishing Company
4050 Westmark Drive
PO Box 1840
Dubuque, IA 52004-1840
Fax: (800) 772-9165
Toll-free: (800) 770-3544
www.kendallhunt.com

$149.99 per teacher's guide
$319.99 per module kit (1 teacher's guide + 1 materials kit)
$284.99 per materials kit
Note: Contact publisher for additional ordering options.

In this teacher's guide, educators will find a series of learning experiences designed to help students understand the impact that waste and its disposal has on our lives. The guide is part of the INSIGHTS program, a hands-on, inquiry-based science curriculum that uses open-ended exploration activities to help students develop process skills and scientific content knowledge. The curriculum encourages students to develop thinking and process skills by trying out ideas and discussing their discoveries. This teacher's guide contains 16 activities that focus on solid waste disposal and water pollution. The lessons begin with an introductory questionnaire to determine the knowledge and conceptions students have about waste and its disposal. Students then collect and analyze a day's waste to become aware of the variety and quantity of discarded materials their class produces. In subsequent activities, students set up their own controlled experiments that yield information about what happens to organic and inorganic wastes over time. Students also see what happens when water passes over discarded wastes and experiment with different ways to get unwanted materials out of water. In a culminating activity, students try to find out about the waste products of local industries and how the wastes are handled. The module concludes with a performance assessment and a final questionnaire to assess students' conceptual growth and development. The teacher's guide includes recommendations for directing open-ended activities and cooperative learning, for teaching students from diverse backgrounds, and for mainstreaming students with mental and physical disabilities. For each activity, the teacher's guide provides teaching suggestions, a summary of learning objectives, and background information, in addition to assessments and reproducible worksheets. Also provided are a glossary and a resource list of books and audiovisual materials. A materials kit and a set of Spanish blackline masters are available. (Author/LCT) ENC-012795



Hard As Ice: A Unit About Lakes & Rivers, Melting & Freezing, and Molecules

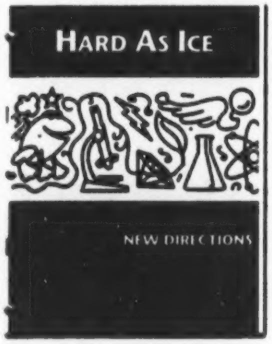
New Directions Teaching Units Series

Grades 5 and 6
1993
Author: developed by the Michigan Science Education Resources Project
Publisher: Michigan Department of Education

Ordering Information
Battle Creek Area Mathematics and Science Center
Unit/Kit Orders
765 Upton Avenue
Battle Creek, MI 49015-4850
(616) 965-9440 / (616) 965-9589

$14.00 per teacher's guide and reproducible student book
Order # 05
$225.00 per hands-on science kit
Order # 05k

Developed as part of the New Directions Teaching Units Series, this teacher's guide provides lesson plans and activities for a unit designed to help students construct a clear understanding of the solid and liquid states of matter. The unit has also been designed to help students learn how to pose questions, search for solutions to problems, work cooperatively, and value the need for evidence in making decisions. Each unit in the series is four to eight weeks long and consists of sequenced lessons based on a common theme. This unit contains 11 lessons in which students describe different forms of water found in the hydrosphere and in the laboratory and construct an explanation of why ice is hard but water flows. Their explanation leads them to the model of matter and the motion and arrangement of molecules that determine whether a substance is liquid or solid. The unit begins with a writing activity in which students compose a letter to a fictitious friend in Phoenix describing the aquatic environments of Michigan. Throughout the unit, students revise their original letters to extend their descriptions to include a scientific explanation and information about the social and economic uses of water. Sample laboratory activities challenge students to predict whether a puddle of water weighs more or less when it is frozen and to freeze other substances and explain the molecular events. Students also investigate whether snow is a liquid, a solid, or something else entirely. For each activity, the teacher's guide provides an overview, advance preparation and materials list, and an illustrated procedure. Discussion questions, background information, and embedded assessments are also included, in addition to transparency masters and reproducible student pages. (Author/LCT) ENC-012896



CURRICULUM PACKAGES WITH A STRONG ASSESSMENT COMPONENT: SCIENCE

Science Interactions, Course 2

Science Interactions Series

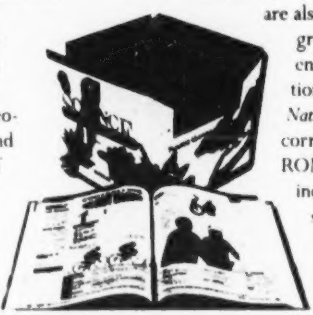
Grade 7
1998
Author: Bill Aldridge, Russell Aiuto, Jack Ballinger, Anne Barefoot, Linda Crow, Ralph M. Feather, Jr., Albert Kaskel, Craig Kramer, Edward Ortleb, Susan Snyder, Paul W. Zitzewitz

Ordering Information
Glencoe/McGraw-Hill
PO Box 543
Blacklick, OH 43004-0543
Fax: (614) 860-1877
Toll-free: (800) 334-7344

$49.98 per student edition
$62.82 per teacher wraparound edition
$13.59 per science discovery activities, teacher edition
Note: Contact publisher for additional information on materials and ordering information.

Standards: National Science Education Standards (NSES) (December 1995)

The Science Interactions Series, designed for middle school and junior high, is a three-year general science program that integrates life, Earth, and physical sciences into four unifying themes: Energy, Systems and Interactions, Scale and Structure, and Stability and Change. The materials in this kit for grade 7 are designed to help students apply the physical principles of motion, force, and pressure to both plate tectonics and the human cardiovascular system. Students also apply work and energy concepts to understand simple machines, thermodynamics, and movement of the human body. Additional topics include properties of metals and nonmetals, minerals, and the rock cycle; coastal zones, the ocean floor, and beach erosion; the properties of gases, atomic theory, weather, and respiration; and the structures and functions of plant and animal cells. Each chapter of the textbook begins with an exploratory activity that allows students to consider questions about the content to come, make observations, and share prior knowledge. Every chapter also includes a variety of activities that offer a combination of open-ended and structured hands-on experiences to encourage students to discover science concepts on their own and to develop critical thinking and problem-solving skills. For example, a sample SkillBuilder activity asks students to compare and contrast the everyday meaning of the word "work" and the scientific definition of that term; in an Expand activity, students use Archimedes' discovery of fluid displacement to find and compare the volume of five irregularly shaped objects; and an Investigate! activity provides directions to make a sheet of recycled paper by hand. Notes in the margins indicate objectives, key terms, and connections to other disciplines or careers. The teacher's guide, a wraparound version of the student text, reviews reforms in science education and provides suggestions for developing students' thinking processes. The guide also includes tips for visual learning and strategies for managing activities in the classroom. Guidelines for assessment, cooperative learning, and meeting individual needs are also discussed. The assessment component of this program includes performance assessment, portfolios, science journals, and rubrics for projects and presentations. The teacher's guide contains correlations to the *National Science Education Standards* (1995) and provides correlating bar codes to multimedia laserdiscs and CD-ROMs. Bibliographic and Internet references are also included. The kit provides additional teacher resources such as a transparency package, laboratory manual, test bank, activity masters, and teacher support for performance assessments and critical-thinking activities. (Author/LCT) ENC-012898



Outbreak!

Event-Based Science (EBS) Series

Grades 5-9
1998
Author: Event-Based Science Project

Ordering Information
Dale Seymour Publications
4350 Equity Drive
Columbus, OH 43228
Toll-free: (800) 321-3106
www.cuisenaire-dsp.com

$9.60 per student edition
$21.98 per teacher's guide and video
$132.00 per set
Note: A classroom set contains 1 teacher's guide with videotape(s) and 15 student editions.

Standards: National Science Education Standards (December 1995); NCTM Curriculum and Evaluation Standards (1989); Science for All Americans (1989)

Using the 1995 outbreak of the Ebola virus in Zaire, this curriculum kit provides a six-week study of human diseases. It is part of the Event-Based Science Series, each module of which contains a video, a teacher's guide, and student text. The videos contain television news coverage of a real science-related event. Discussion of the event reveals students' prior knowledge of the related science concepts, and an authentic group project helps teams of students refine their knowledge and explore new concepts and processes. This unit uses a segment from NBC's Today show to generate interest in epidemiology. The segment shows scientists and medical personnel on the scene in Kikwit, Zaire, when a deadly outbreak of the Ebola virus struck the population. Students then form teams that will investigate the identity of an unknown disease that is spreading through their community. Background information and hands-on science activities help teams gather additional data. In sample activities, students use a dichotomous key to identify bacteria, use a microscope to examine samples of food and water for the presence of microorganisms, and investigate the effects of different medicines on the growth of yeast. The unit also provides interdisciplinary activities that incorporate mathematics, social studies, and writing. Each activity is correlated to national standards for math and science education. The guide also summarizes learning objectives and provides instructions, a schedule of activities, and a list of materials. The student text contains readings and activity sheets. The assessment component of this unit consists of authentic assessments, rubrics for the science activities and group projects, and a comprehensive writing assignment that includes a peer response and self-assessment. Charts, tables, answer keys, and masters for student worksheets are also provided. (Author/LCT) ENC-012798

Biology, a Community Context

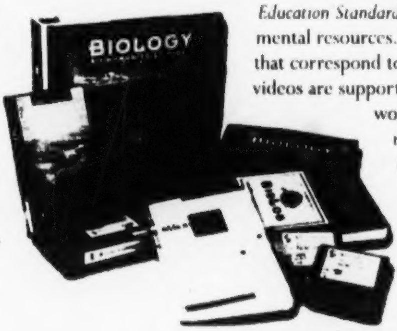
Grades 9, 10
1998
Author: William H. Leonard, John E. Penick

Ordering Information
South-Western Educational Publishing
Thompson Learning
PO Box 6904
Florence KY 41022
Fax: (800) 487-8488
Toll-free: (800) 824-5179
Email: e-mail@catalog.thomson.com

$66.95 per student text
$106.95 per teacher's guide
$130.95 per video
$154.95 per instructional resource notebook
$202.95 per software package (specify Mac or Dos)
Note: Contact publisher for additional ordering information.

Standards: Benchmarks for Science Literacy (1993); National Science Education Standards (December 1995)

The textbooks and instructional materials in this kit are designed for an inquiry-based curriculum for high school general biology classes. The curriculum uses a seven-part learning experience that models the scientific method. Each unit begins with a short video segment designed to challenge students to think about biological problems in today's world. Additional stages of the learning experience include guided inquiry, self-assessment, and extension activities from which students and teachers select several to further explore their areas of interest or concern. For the culminating activity of each unit, students enact scenarios that demand a decision and plan of action for dealing with a specific biological issue related to the unit. For example, the genetics unit contains seven guided activities that include making and analyzing karyotypes, modeling mitosis, and extracting DNA. After completing these activities, students choose from seven extension activities that simulate the processes of protein synthesis, mutation, DNA fingerprinting, or recombinant DNA technology. Throughout the course, students keep a biology notebook that includes entries for brainstorming sessions, questions, collected data, observations, and thoughts as they reason through science problems. The teachers' guide provides teaching tips, safety information, exams, assessment rubrics, and blackline masters. Additional materials include an Instructional Resource book, two videos, and software for tests and a grade book. The Resource Book contains additional teacher materials, alternate and supplemental unit activities, and readings. This book also contains assessment ideas and tools, blackline masters, correlations to the *National Science Education Standards* (1995), and a bibliography of supplemental resources. The videos provide news segments that correspond to each unit in the student edition. The videos are supported by a Classroom Guide with activity worksheets to encourage discussion and reinforce science concepts. (Author/LCT) ENC-012947



Chemistry: Connections to Our Changing World

Grades 10 and 11
1996
Author: H. Eugene LeMay, Jr., Herbert Beall, Karen M. Robblee, Douglas C. Brower

Ordering Information
Prentice Hall
School Division Orders
4350 Equity Drive
PO Box 2649
Columbus OH 43216
Fax: (614) 771-7361
Toll-free: (800) 848-9500

$41.97 per student edition
$89.97 per teacher's edition
$11.97 per laboratory manual
Note: Additional materials and ordering options available. Contact publisher for information.

Standards: National Science Education Standards (December 1995)

The textbooks and other resources in this curriculum kit are intended for a year-long general chemistry course designed to make chemistry more interesting and accessible by providing relevant connections to students' lives. The curriculum uses a four-step learning cycle (Engage, Explore, Teach, and Assess) that incorporates a constructivist approach and opportunities for activity-based instruction, thematic teaching, and real-world problem solving. The course is divided into 10 units that begin with an introduction to the nature of chemistry, energy, and matter. Subsequent units cover atomic structure and the periodic table, chemical bonding and reactions, and stoichiometry and states of matter. Additional topics include chemical equilibrium, acid base and oxidation reduction reactions, and reaction kinetics and thermodynamics. The last unit discusses nuclear chemistry and introduces organic chemistry. The student text is supported by colorful illustrations and margin notes that reinforce important points and provide questions to check comprehension. The teacher's guide contains reduced student pages with wraparound copy that contains suggestions for implementing the learning cycle, ideas for visual aids and in-class activities, and formative assessments. Additional support includes demonstrations, references to materials in the teacher's resource package, and point of use barcodes for the CHEMedia videodiscs and computer simulation software. The teacher's resource package consists of a support booklet for each chapter in the text and six additional booklets with information and reproducible worksheets on laboratory safety, problem-solving skills, and graphing calculators, as well as ideas for performance-based assessment, reference tables, and a Spanish translation of the student glossary. The curriculum also includes laboratory manuals, a computer testbank, answer keys, and a set of color transparencies. Other books include a Teacher's Desk Reference and a book of classroom management solutions. The Desk Reference contains professional development articles that address such educational issues as the national standards, writing in science, alternative assessments, and multicultural awareness. CHEMedia laserdiscs and software are available separately. (Author/LCT) ENC-012857

INTERNET SITES

Here is a carefully selected list of Internet sites that address classroom instruction and assessment issues. They provide a wide array of research results, ideas, and discussion points for teachers, and activities to try with your students or colleagues.

National Center for Research on Evaluation, Standards, and Student Testing

www.cse.ucla.edu/

Grades K-12
Author: Center for the Study of Evaluation (Los Angeles, CA)

Visitors to this site will find a variety of assessment-related materials, including newsletters, technical reports, and general interest papers. CRESST publications, reports, and newsletters focus on current issues and topics of assessment research. The site features current and past issues of the CRESST Line newsletter, the Evaluation Comment newsletter, proceedings of the annual CRESST conference, CRESST technical teports, and a general interest file. The CRESST Alternative Assessments in Practice Database contains more than 250 sources of alternative assessments developed by a variety of agencies in the United States and overseas. These sources are intended for use by by teachers, school district administrators, assessment developers, and others interested in new methods for assessing student growth. The database contains detailed information about each assessment, including subject matter and skills measured, assessment type and purpose, scoring characteristics, and availability of the assessment. Many of the new assessments contain short-answer items, essay questions, nonstandard written products, and experiments. Some also feature demonstrations, use of manipulatives, and hands-on tasks. This site provides related web links to sites such as as the United States Department of Education, and the American Educational Research Association. Winner, ENC Digital Dozen, August 1997. (Author/LDR) ENC-002645

The pH Factor

www.miamisci.org/ph/default.html

Grades K-12
Author: developed by the Miami Museum of Science; resource coordinator, Ted Myers

Teachers of all grade levels can use this web site, developed by the Miami Museum of Science, for background information, lesson plans, and activities about pH. The site is designed around the Seven E's, a constructivist approach to learning where students build new learning based on their prior experiences. The first section, Excite, contains activities to stimulate the learner's curiosity; the Explore section is intended to satisfy curiosity through activities such as a simulated pH meter that measures common solutions and shows the how the solution affects an indicator dye. Background information is located under the Explain icon, where text explains the concept and defines the terms. In sample lessons, students create mathematics manipulatives to explore powers of 10, review the relationship between atoms, ions, acids, and bases, and examine pH tables and graphs. Activities in the Expand section help students discover new applications, such as using acidic and basic solutions to clean pennies. In a second Expand activity, students take pH measurements for rain in their neighborhood and compare it with other students' findings. In the Extend section are suggestions to help teachers extend the concept into other content areas. The Exchange section provides teachers with an opportunity to share ideas, lesson plans, or experiences. Finally, the Examine icon provides ideas for alternative assessments such as performance-based assessment, authentic or project assessment, portfolios and journal assessments. Winner, ENC Digital Dozen, July 1996. (Author/LCT) ENC-002004

Assessment & Accountability Program

www.nwrel.org/eval/index.html

Grades K-12
Author: Northwest Regional Educational Laboratory (NWREL)

The Northwest Regional Educational Laboratory (NWREL) is a private, nonprofit corporation that gives research and development assistance to education, government, community agencies, business and labor. The corporation primarily serves the Northwest region (Alaska, Idaho, Montana, Oregon, and Washington) as a part of a national network of 10 educational laboratories. At their web site, they provide annotated bibliographies of articles that address the issue of alternative assessment—particularly portfolios—in mathematics, reading, science, and social studies. An analytical writing assessment model details a five-point scoring rubric for six aspects of writing: ideas and content, organization, voice, word choice, sentence fluency, and use of conventions. Specific examples of alternative assessments are available through the Alternative Assessment Toolkit page. For example, the Oregon State Assessment guide is given as an example of mathematics assessment for problem solving. It includes a sample of the type of short, open-ended question that might be given to fifth graders, along with the scoring guides used in the assessment. Other alternative assessment examples include the Aquarium Problem, a project designed to assess students' knowledge of mathematics as they determine how best to equip and stock an aquarium. Visitors will also find scoring rubrics, developed by the California Department of Education, for evaluating student responses to open-ended questions or investigations in mathematics. Winner, ENC Digital Dozen, November 1996. (Author/GMM) ENC-002115

AE Assessment & Evaluation

ERIC Clearinghouse on Assessment and Evaluation World Wide Web Home Page

ericae.net

Grades K-12
Author: Liselle Drake and Larry Rudner
Publisher: Catholic University of America

This web site provides information and resources pertaining to educational assessment, evaluation, and learning theory. Featured are sources for locating and evaluating tests, as well as pointers for searching various ERIC databases on the Internet. Also found at the site are measurement and evaluation news and full-text essays on assessment topics. A digest article identifies additional Internet resources such as gopher sites, web sites, and listserv of particular interest to the assessment community. (Author/VN/KAP) ENC-008689

Pathways to School Improvement

www.ncrel.org/sdrs/pathways.htm

Grades K-12
Author: webmaster, Jim Nauta

Pathways, a product of the North Central Regional Educational Laboratory NCREL), addresses critical issues identified by educators, researchers, and community leaders. National leaders in each area provide practical, research-based solutions to these issues. Contributions to the site come from America's leading educational research centers and universities. Mathematics and science topics include: locating, using, and integrating Internet-based materials; providing hands-on and authentic learning experiences; implementing curriculum, instruction, and assessment standards for math and science education; and ensuring equity and excellence in mathematics and science. Other topics include assessment, professional development, and school-to-work transitions. Pathways contains a variety of articles, graphics, movies, and sound files, as well as many links to other exemplary Internet resources for education. This site has won many awards, including Point Communications, Top 5% of all web sites and Pacific Bell's blue Web'n award. Winner, ENC Digital Dozen, August 1995. (Author/DEB) ENC-002454

Whelmers

www.mcrel.org/whelmers/

Grades K-12
Author: Steven L. Jacobs
Standards: National Science Education Standards (December 1995)

The 20 teacher demonstration activities (Whelmers) on this site are intended to "whelm" students by sparking their curiosity about science. Whelmers are designed as a tool to engage students and to draw their attention from the incredibly busy and hurried lifestyle we all experience. These activities are based upon activities contained in Jacobs' Whelmers, Volume I and have been aligned with the *National Science Education Standards* (1995). A sample activity, the Balloon Vacuum, demonstrates the relationship between air pressure and the heat and volume of a gas by mysteriously sucking a balloon into a flask. Another activity, An Inch of Skin, shows students how to locate different types of nerve receptors in their skin. The activity Falling Test Tubes? uses two glass test tubes and water to create a discrepant event that demonstrates adhesion and cohesion. Each activity is accompanied by an overall description and the science process skills incorporated into the activity, as well as complex reasoning strategies, concept topics, and materials and instruction. In addition, each activity is also cross-listed according to the specific NSES standards for grades K-4, 5-8, and 9-12. The site provides suggestions for individual and group assessments, as well as information about Whelmers workshops and materials. Winner, ENC Digital Dozen, June 1996. (Author/LCT) ENC-001096

Practical Assessment, Research and Evaluation (PARE): A Peer-Reviewed Electronic Journal

ericae.net/pare/

Grades K-12

Author: Educational Resources Information Center Clearinghouse on Assessment and Evaluation (ERIC/AE)

PARE is an electronic journal published by the ERIC Clearinghouse on Assessment and Evaluation (ERIC/AE) at the University of Maryland, College Park. The online journal provides access to ful- text articles about assessment, evaluation, and teaching practice. Users can search for specific titles, authors, and key words, or browse a list of topics that includes test use and construction, standardized tests and test format, and evaluation methods for teachers and students. Other topics include educational research, statistical analysis, and teaching methods. The articles are also indexed according to audience, with lists of articles presented for researchers and evaluators as well as teachers and students. (Author/LCT) ENC-016570

For Further Reading

Use this list of articles as a starting point for your own exploration into the subject of assessment in mathematics and science.

Black, P., & William, D. (1998, October). Inside the Black Box: Raising Standards Through Classroom Assessment. *Phi Delta Kappan*, 80, 139-144.
Firm evidence shows that formative assessment is an essential ingredient of classroom work and that its development can raise achievement standards.

Carroll, W. M. (1998, March-April). Middle School Students' Reasoning About Geometric Situations. *Mathematics Teaching in the Middle School*, 3 (6), 398-403.
This article describes several short geometry tasks that go beyond the simple recognition of figures and properties. The author presents scoring rubrics and questions that might be useful to middle school teachers who are developing short open-ended questions to encourage and assess students' thinking.

Childers, P. B. & Lowry, M. (1997, November-December). Engaging Students Through Formative Assessment in Science. *Clearing House*, 71 (2) 97-102.
The focus in this article is an eighth-grade science class in which students took part in a series of yearlong writing activities using portfolios. The authors suggest that students found this formative focus productive and valuable and took a more active role in mastering the course content than if the course had been structured around traditional summative assessments.

Geocaris, C., & Ross, M. (1999, September). A Test Worth Taking. *Educational Leadership*, 57 (1), 29-31.
In one Illinois high school, teachers realized that their testing practices were out of sync with their instructional beliefs. Through research, meetings, and reflection time, they developed guidelines for creating tests that give students choices and accommodate different learning styles and multiple intelligences.

Kennedy, D. (1999, September). Assessing True Academic Success: The Next Frontier of Reform. *Mathematics Teacher*, 92 (6), 462-466.
The rules of the educational game are simple, as Kennedy explains: "We, the teachers, show them what to do and how to do it; we let them practice it for a while; and then we give them a test to see how closely they can match what we did. What we contribute to this game is called 'teaching,' what they contribute is called 'learning,' and the game is won or lost for both of us on test day. Ironically, thinking is not only absent from this process but in a curious way actually counterproductive to the goals of the game" (p. 462). The article is also available online at www.nctm.org/mt/1999/09/reform.html

Leitze, A. R., & Mau, S. T. (1999, February). Assessing Problem-Solving Thought. *Mathematics Teaching in the Middle School*, 4 (5), 305-11.
Assessing problem-solving is more complex than assessing other activities. Here the authors look in detail at an analytic scoring rubric, one method of assessment, as applied to sixth-graders' work with the following TV Tally problem: "About how many hours of television have you watched in your lifetime?"

Lundberg, R. (1997, January). Student-Generated Assessment. *Science Teacher*, 64 (1) 50-53.
Lundberg discusses the use of student-generated rubrics in science classes that require students to design their own laboratory activities to solve open-ended problems.

Madaus, G. F., & O'Dwyer, L. M. (1999, May). A Short History of Performance Assessment: Lessons Learned. *Phi Delta Kappan*, 80 (9), 688-95.
This historical perspective on performance assessment can help arm people "against surrendering to the panaceas peddled by too many myth makers." The authors note that as far back as the 16th century, people already knew the power of an examination to shape what is taught and learned.

McKnight, C. C., & Schmidt, W. H. (1998, March). Facing Facts in U.S. Science and Mathematics Education: Where We Stand, Where We Want to Go. *Journal of Science Education and Technology*, 7, (1), 57-76.
With a goal of boosting academic achievement in the United States, this article discusses appropriate goals for mathematics and science educators. Conclusions are based on data from the Third International Mathematics and Science Study (TIMSS).

O'Neil, J., & Tell, Carol. (1999, September). Why Students Lose When 'Tougher Standards' Win: A Conversation with Alfie Kohn. *Educational Leadership*, 57 (1), 18-23.
This article presents noted educational advocate Alfie Kohn's views on high-stakes assessment and "tougher standards." Kohn believes that true learning, in which students help design their own learning experiences and teachers can develop a curriculum based on their students' needs, necessarily takes place in an atmosphere of critical thinking and lasting understanding. In contrast, Kohn claims that the "tougher standards" movement results in stultifying conformity. The article can be found online at www.ascd.org/pubs/el/sept99/oneil.html

Parker, D. L., and Picard, A. J. (1997, March). Portraits of Susie: Matching Curriculum, Instruction, and Assessment. *Teaching Children Mathematics*, 3 (7), 376-382.
Seven-year-old Susie is the focus of this article, which details her mathematical performance. In class, her work embodies much of what is important according to the NCTM Standards. However, Susie speaks little English and therefore scores low on standardized, norm-referenced tests.

Santel-Parke, C., & Cai, J. (1997, September). Does the Task Truly Measure What Was Intended? *Mathematics Teaching in the Middle School*, 3 (1) 74-82.
In this article, the authors describe a performance assessment tool that entails open-ended tasks. These tasks require students not only to provide answers but also to show their solution processes. The authors consider the need to assess important mathematical content and the use of effective prompts and realistic contexts.

Shepardson, D. P., & Jackson, V. (1997, October). Developing Alternative Assessments Using the Benchmarks. *Science and Children*, 35, (2) 34-40.
The authors of this article describe a process for developing alternative assessment instruments and student responses. Focusing on the student's thought processes and performance, the article also illustrates the use of scoring rubrics.

Stiggins, R. J. (1999, November). Assessment, Student Confidence, and School Success. *Phi Delta Kappan*, 81 (3), 191-198.
Stiggins questions the notion that intimidation by assessment will lead to more effective schools. He offers an alternative vision in which we use assessment to build student confidence in the service of school improvement.

Wideen, M. F., O'Shea, T., Pye, I., & Ivany, G. (1997, Fall). High-Stakes Testing and the Teaching of Science. *Canadian Journal of Education*, 22 (4), 428-44.
Case studies from two schools in British Columbia, Canada, provide the context for studing the relationship between high-stakes testing and the teaching of science.

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- ○ computer specialist
- ○ curriculum specialist
- ○ parent
- ○ student
- ○ other

My area is: (Check only one.)

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- ○ mathematics education
- ○ science education
- ○ math/science education
- ○ educational technology
- ○ computer science
- ○ library science
- ○ other

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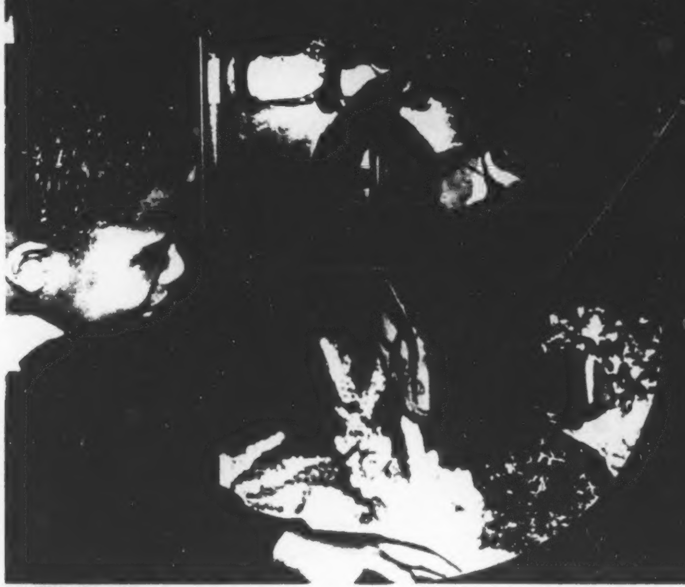

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